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Woman -
Photograph by Richard Schull.
Scene at Weston
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THE
JOURNAL
OF THE
ROYAL AGRICULTURAL SOCIETY
OF ENGLAND.

Third Series.

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CONTENTS OF VOLUME I.

THIRD SERIES.

1890.

"A SCENE AT WISETON" (see page 147) . . . *Frontispiece*

Special Articles.

	PAGE
The Foundation of the Royal Agricultural Society	1
By ERNEST CLARKE, Secretary of the Society and Editor of the Journal.	
Fifty Years' Progress of British Agriculture	20
By the Right Hon. Sir JAMES CAIRD, K.C.B., F.R.S.	
Notes on Agricultural Education at Home and Abroad	37
By JOHN DENT DENT.	
The Early Fattening of Cattle and Sheep	47
By HENRY EVERSHED.	
The Food of our Agricultural Crops	69
By Sir J. B. LAWES, Bart., LL.D., F.R.S.	
The Disposal of Sewage by Small Towns and Villages	86
By CLARE SEWELL READ.	
Observations and Experiments on some English Pastures	95
By WILLIAM CARRUTHERS, F.R.S., F.L.S.	
The Evolution of the Horse (<i>Illustrated</i>)	110
By Prof. W. H. FLOWER, C.B., D.O.L., LL.D., F.R.S.	
Basic Cinder as Manure	129
By Prof. E. KINCH.	
Agricultural Worthies: I. The Third Earl Spencer (<i>Illustrated</i>)	138
With an Appended Note by the Right Hon. Sir HARRY VERNEX, Bart.	

	PAGE
The Development of Agricultural Machinery	257
By DAN. PIDGEON, Assoc.Inst.C.E.	
The Agricultural Lessons of "The Eighties"	275
By Prof. WRIGHTSON.	
The Report of the Royal Commission on Horse Breeding	289
By Lord RIBBLESDALE.	
Tuberculosis in Animals, and its Relation to Consumption in Man	305
By W. DUGUID.	
Fifty Years of Hop Farming (<i>Illustrated</i>)	321
By CHARLES WHITEHEAD, F.L.S., F.G.S.	
The Best Means of Increasing the Home Production of Beef	349
By GILBERT MURRAY.	
The Herbage of Pastures (<i>with a Map</i>)	359
By W. FREAM, LL.D.	
Covered Cattle Yards (<i>Illustrated</i>)	473
By W. J. MOSCROP.	
The Seed and its Germination (<i>Illustrated</i>)	490
By Prof. J. R. GREEN, M.A., B.Sc., F.L.S.	
Farming in Devon and Cornwall (<i>Illustrated</i>)	511
By F. PUNCHARD.	
The Plymouth Meeting (<i>with a Plan</i>)	537
The Trials of Light Portable Motors at Plymouth (<i>Illustrated</i>)	580
By Prof. W. C. UNWIN, F.R.S.	
The Trials of Grist Mills and Disintegrators at Plymouth (<i>Illustrated</i>)	604
By DAN. PIDGEON, Assoc.Inst.C.E.	
Miscellaneous Implements at Plymouth (<i>Illustrated</i>)	624
By JAMES EDWARDS.	
Agricultural Administration in Austria-Hungary (<i>with a Map</i>)	673
By ERNEST CLARKE.	
Crops for Pickling and Preserving	710
By W. J. MALDEN.	
Foot-rot in Sheep (<i>Illustrated</i>)	732
By Various Writers.	
The Composition of some of the Famous Ancient Pastures of England	751
By WILLIAM CAREWHERES, F.R.S., F.L.S.	
The Trials of Cider-making Plant at Glastonbury (<i>Illustrated</i>)	764
By DAN PIDGEON, Assoc.Inst.C.E.	
The Farm Prize Competition of 1890 (<i>Illustrated</i>)	776
By F. PUNCHARD.	

Official Reports.

	PAGE
Report of the Council to the Half-Yearly General Meeting of Governors and Members, December 12, 1889	157
Annual Report for 1889 of the Consulting Botanist	167
By WILLIAM CARRUTHERS, F.R.S., F.L.S.	
Annual Report for 1889 of the Consulting Entomologist (<i>Illustrated</i>)	170
By ELEANOR A. ORMEROD.	
Annual Report for 1889 of the Royal Veterinary College (<i>Illustrated</i>)	184
By Prof. G. T. BROWN, C.B., Principal of the College.	
Quarterly Report of the Chemical Committee, March 1890	192
Report of the Council to the Anniversary General Meeting of Governors and Members, May 22, 1890	398
Report on the Bullock-Feeding Experiments at Crawley Mill Farm, Woburn, during the Winter of 1889-90	399
Reports of the Consulting Entomologist	407
Report of the Royal Veterinary College	413
Quarterly Report of the Chemical Committee, June 1890	414
Report of the Education Committee on the Results of the Senior Examination of May 1890	421
Quarterly Report of the Chemical Committee, July 1890	636
Report of the Council to the Half-Yearly General Meeting of Governors and Members, December 11, 1890	824
Annual Report for 1890 of the Consulting Botanist	834
By WILLIAM CARRUTHERS, F.R.S., F.L.S.	
Report of the Consulting Entomologist, November 1890	837
Annual Report for 1890 of the Consulting Entomologist	844
By ELEANOR A. ORMEROD.	
Quarterly Report of the Chemical Committee, December 1890	847
Reports of the Education Committee:—	
(a) On Technical Education in Agriculture	851
(b) On the Results of the Junior Examination of November 1890	854

Notes, Communications, and Reviews.

	PAGE
Fruit Farming for Profit. By CHARLES WHITEHEAD, F.L.S., F.G.S.	197
Influenza in Horses. By Prof. G. T. BROWN, C.B.	199
Arthur Young's Travels in France. By ALBERT PELL	202
Note upon a Case under the Agricultural Holdings Act, 1883 By S. B. L. DRUCE.	204
Shetland Ponies. By R. BRYDON	207
Fruit Evaporation in America. By DAN PIDGEON, Assoc.Inst.C.E.	210
The Improvement of the Art of Horse-Shoeing. By CHARLES CLAY	213
Heredity. By W. FREAM, LL.D.	214
Market Gardening in the Scilly Islands. By E. BREWER	219
The Harvest of 1889 at Home and Abroad. By W. E. BEAR	223
Day on Horse-Breeding. By ALFRED ASHWORTH	232
The Show of Thoroughbred Stallions	235
Wood Shavings for Litter. By J. W. LEATHER, Ph.D.	238
The Weather of 1889	239
Home Produce and Foreign Imports in 1889	242
The Price of Wheat in 1889	248
Recent Agricultural Inventions	249
Obituary Notices of Deceased Members	253
The Market Value of the Different Samples of Wheat and Barley grown in 1889 on the Experimental Plots at Rothamsted. (<i>Communi- cated by the Lawes Agricultural Trust Committee</i>)	432
Boundary Fences. By S. B. L. DRUCE	437
The Cultivation of Sugar-Beet	441
Harvesting Wheat in Wet Seasons	450
The Horse and its Historians	452
Vegetable and Fruit Farming	454
Food Value of the Wheat Germ	456
Heredity and Sexuality	457
Recent Agricultural Inventions	461
Statistics affecting British Agricultural Interests	465
The Report of the Select Committee on the Hop Industry By CHARLES WHITEHEAD, F.L.S., F.G.S.	640

Contents of Volume I.

vii

	PAGE
The Murchland Milking Machine (<i>Illustrated</i>)	645
By RICHARD HENDERSON.	
Good Tenantable Repair. By S. B. L. DRUCE	652
Thistle Seeds. By S. B. L. DRUCE	653
The Price of Imported Grain. By R. HENRY REW	654
The Agricultural Statistics of the United States (<i>with a Map</i>)	657
Recent Agricultural Inventions	662
Allotments and Small Holdings	666
Statistics affecting British Agricultural Interests	671
Covered Cattle Yards. By JOHN DENT DENT.	860
Prices of Store Cattle per Live Stone, and Official Quotations	862
By ALBERT PELL.	
Chicken and Poultry Farming in Germany. By Hon. A. H. CATHCART.	865
Gross Rent v. Nett Rent. By F. PUNCHARD.	869
The Vegetable Supply of a large Town	874
By MAURICE L. DE VILMORIN.	
The Tenant's Compensation Act, 1890. By S. B. L. DRUCE.	876
Physiology of the Domesticated Animals	879
Recent Agricultural Inventions	882
Statistics affecting British Agricultural Interests	885

APPENDIX.

List of Council of Royal Agricultural Society of England, 1890	i
Standing Committees for 1890 and List of Officers	iii
Distribution by Counties of Members and Council	v
List of Honorary Members of the Society	vi
List of Governors of the Society	vii
Table showing Number of Governors and Members in each Year from the Establishment of the Society	xi
Balance Sheet for 1889, with appended Statements of General and Country Meeting Receipts and Expenditure	xii
Prizes offered in connection with Plymouth Meeting, June 1890	xx
Proceedings of the Council, February 5, 1890	xxvii

	PAGE
Proceedings of the Council, March 5, 1890	xxxix
Additions to Library during 1889	xlix
Privileges of Members	lviii
Memoranda of Meetings, Payment of Subscriptions, &c.	lxiv
Proceedings of the Council, April 2, 1890	lxv
Proceedings of the Council, May 7, 1890	lxxiv
Proceedings of the Council, June 4, 1890	lxxxiii
Proceedings at the General Meeting, May 22, 1890	xcii
Proceedings of the Council, June 25, 1890	xcvii
Proceedings of the Council, July 30, 1890	xcix
Proceedings at the General Meeting, June 24, 1890	cxvii
Officials and Judges at the Plymouth Meeting	cxxii
Award of Prizes at the Plymouth Meeting	cxxv
Memoranda of Meetings, &c.	clxxxiv
Proceedings of the Council, November 5, 1890	clxxxv
Proceedings of the Council, December 10, 1890	cxcviii
Proceedings of the Council, December 18, 1890	ccvi
Proceedings at the General Meeting, December 11, 1890	ccix
Prizes offered in connection with Doncaster Meeting, June 1891	ccxiii

DIRECTIONS TO THE BINDER.

All the pages of text (1 to 888) should come first in the bound volume; and the pages of Appendix (i to ccxvi) at the end.

Text :—Pages 1 to 256 of the text are included in Part I. (March 31, 1890); pages 257 to 472 in Part II. (June 30, 1890); pages 473 to 672 in Part III. (Sept. 30, 1890); and pages 673 to 888 in Part IV. (December 31, 1890).

Appendix :—Pages 1 to lxiv are included in Part I.; lxv to xevi in Part II.; xcvii to clxxxiv in Part III.; and clxxxv to ccxvi in Part IV.

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JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

THE FOUNDATION OF THE ROYAL AGRICULTURAL SOCIETY.

By the time this first number of the Third Series of the Journal is issued from the press, the Royal Agricultural Society will have commenced its second half-century of corporate existence. The contemporaneous commencement of a new period in the Society's life, and of a new departure in the appearances and character of its Journal, gives a certain appropriateness to the starting of the New Series by a summary account of the origin and early history of the Society up to the time when it received the Royal recognition implied by the patronage of Her Majesty the Queen and the grant of a Charter under the Great Seal.

Unhappily, all those who were familiar with the internal working of the English Agricultural Society at the time of its inception are now deceased, and though the "Royal" is fortunate in having still associated with it two survivors of the original Committee, Sir Harry Verney, the "father" of the Society, and Sir Thomas Acland, our veteran Trustee, neither of these two gentlemen has felt able, with the information at his command, to undertake a sketch of the foundation of the Society, though they have both given most valuable help and suggestions, and Sir Harry Verney has contributed to the present number an interesting personal sketch of his old friend and colleague, Earl Spencer, the chief founder of the organisation.

In the absence of a narrative by one who could speak from personal experience, it was judged best that the office of chronicler of the earliest doings of the Society should be undertaken as an official duty by the Secretary, who had the readiest access to its records and minutes; and to that decision is due the fact that the honourable duty of contributing the first article in the New Series has fallen to the present writer.

The commencement of the Royal Agricultural Society took place, as Sir Harry Thompson has well put it, "during one of those recurring fits of associative activity to which Englishmen are periodically prone." It was at the annual dinner of the Smithfield Club, held at the Freemasons' Tavern, Great Queen Street, on December 11, 1837, that the project of establishing a new Society for the encouragement and development of British agriculture was first publicly mooted. The leading figure in this movement was Earl Spencer, better known throughout the greater part of his life as Lord Althorp, a nobleman who may be regarded as, *par excellence*, the originator of the Society.

When proposing, in his capacity as President, "Success to the Smithfield Club," Earl Spencer observed that their attention should not be confined to cattle alone, but should also be directed to the general interests of farming; for he could say, from his own experience, that agriculture was capable of much improvement. His lordship (whose observations were received in the most enthusiastic manner by one of the largest meetings of agriculturists ever assembled at the dinner of the Club) went on to say that he had himself observed how much, of late years, farms had improved, but it was his sincere belief that farming in England was yet in its infancy; and he gave utterance to an expression which has since formed the keynote of the then unborn Society's operations, and was soon to become embodied in a now familiar motto.

"The application of *science to practice*" (said Lord Spencer) "was not as yet made by the English farmer; but if the experiments that had been successfully tried elsewhere were made intelligible to him, and the practicability of them explained, he had no doubt but that an improvement would soon take place that few had any conception of. If a Society were established for agricultural purposes exclusively, he hesitated not to say that it would be productive of the most essential benefits to the British farmer. . . . There was one point, however, which he must strongly impress upon them, in reference to the formation of a Society such as he had mentioned—namely, that there could be no prospect of their obtaining any useful results, unless politics, and the discussion of all matters which might become subjects of legislative enactment, were scrupulously avoided at their meetings."

It will be seen that at the close of this passage, as at its commencement, Earl Spencer, with remarkable prescience, touched in decided terms on the very points which have secured

to the Royal Agricultural Society a career of uninterrupted success as a great national undertaking. His lordship specially alluded to the Highland Society of Scotland as an example to be followed, and was warmly supported in his proposal by the next speaker, the Duke of Richmond, who also pointed to the Highland Society (of which his Grace was an active and honoured member) as one which had been the means of diffusing information on agricultural topics throughout the country, and had thus been of essential benefit to the farming interests of Great Britain. "I cannot" (added the Duke) "see any reason why the farmers of England should fail to imitate so excellent an example; and as an individual I feel it my duty to give my support to my noble friend in his exertions to institute such a Society, because I am convinced that such an institution will promote agriculture and confer great and inestimable advantages on every class of the community."

The proposal made by Earl Spencer was further supported in cordial terms by Mr. Henry Handley, M.P. for Lincolnshire, who said it was an object which he had long had at heart, and that "there was not, in his opinion, a single department of farming but was capable of vast improvement;" and the Earl of Scarborough, Lord Maidstone, Lord William Lennox, Mr. R. J. Eaton, M.P. for Cambridgeshire, Mr. C. Hillyard, Mr. Wilmot, and others, also expressed a desire to co-operate in establishing the proposed Society. Indeed, no dissentient voice was heard, and the project was fairly launched under unusually favourable auspices.

The daily newspapers of the period had but little to say on the proposal, some ignoring it altogether, whilst others did not seem to grasp its full purport; but the idea was not allowed to rest, and encouragement came from various quarters. The leading agricultural paper of the day called upon landed proprietors "to stand forth in aid of an institution, to support which they are encouraged not only by the certainty of national benefit, but also by the additional stimulus of private interest," and the provincial press contained numerous letters and comments on the subject, all, in the main, appreciative and hopeful.

In January, 1838, a long and important letter—subsequently published in the form of a pamphlet¹—was addressed to Earl Spencer by Mr. Handley, who reviewed most ably the circumstances of the time and the advantages to be anticipated from the formation of "an Institute to promote practical agriculture on scientific principles." Premising that his letter would pro-

¹ *A Letter to Earl Spencer, President of the Smithfield Club, on the Formation of a National Agricultural Institution.* By Henry Handley, Esq., M.P. London: James Ridgway & Sons, Piccadilly. 1838. 36 pp.

bably have never been submitted to the public but for the observations made by Lord Spencer at the Smithfield Club dinner, Mr. Handley spoke of the comparative failure of the old Board of Agriculture as having been "frequently quoted as a discouragement to any similar attempt," but regarded this objection as of little weight, for that Board "existed at a period when it was least likely to attract the settled attention or command the energies of agriculturists," whilst "it was discontinued at the precise time when, as subsequent events have proved, it ought to have been established."

"A period of war," continued Mr. Handley, "is ill suited to national improvements of any kind. During the continuance of war prices, when half a crop remunerated the grower, and the most slovenly farmers amassed wealth, the usual inducements to extraordinary exertions were wanting; and we of the present day, to whom the quotations of 'wheat from six to eight guineas per quarter' are but as dreams of fiction, are not only surprised that our more fortunate predecessors did not effect more—we only wonder that, if possible, they did not exert themselves less."

"In 1817 [1819?], however, the date when the Board of Agriculture ceased to exist, a new era was about to open upon us; and without discussing the debateable causes of the depression of agriculture which has since ensued, whether arising from the transition from war to peace, the resumption of cash payments in 1819, excessive importation or over-production, it is sufficient to have ascertained that a vast reduction has taken place in the prices of agricultural produce; and it is at least prudent to anticipate that for the future we must look to comparatively low prices—subject, of course, to the variations which seasons and circumstances must from time to time necessarily entail."

"Farmers are, I believe, at length convinced that it is not in Parliamentary interference that they must seek a remedy. Repeated inquiries have terminated in repeated disappointments. It is to their own energies and their own resources they must look, and by cheapening the cost and increasing the amount of production pave the way to future prosperity."

Having thus reviewed the situation, Mr. Handley went on to speak of the "wretched modes of farming" still to be seen in many parts of the country, whilst there had been a "rapid and marked improvement in the breed of stock, both cattle and sheep." Expressing his belief that this improvement was largely attributable to the stimulus afforded by the Smithfield Club, and by minor societies established on its principles throughout the country, "why," he asked, "should not the same combined efforts be united in the application of science to the sister art, agriculture?" As an example of the prejudices of farmers of the old school against what they called "book-farming," and of the suspicion with which they regarded innovation, Mr. Handley cited the use of bone-manure, "which, incredible as it may appear, though it has for the last twenty years worked miracles, and changed the face of the Midland counties, is at this time viewed as a new discovery in many districts of England by no means

remote from the scene of its earliest and continued success." That class was, however, fast passing away, owing to the advance of education and increased facilities of communication, and it was in the interests of the young farmer that the aid of science was to be invoked :—

"Science—by which is to be understood that knowledge which is founded upon the principles of nature, illustrated by demonstration—is the pilot that must steer us into those hitherto imperfectly explored regions, where I am well convinced a mine of wealth is still in store for British agriculture. Chemistry, Botany, Entomology, Mechanics, require but to be invited, to yield us a harvest of valuable information to guide and to warn us."

As to the nature and constitution of the proposed Society, Mr. Handley cordially coincided in Earl Spencer's view that it should exclude political matters from its consideration, and "should be purely confined to the advancement of agricultural science, and the encouragement of the most approved *practice*." The details of Mr. Handley's suggestions, realised and unrealised, will be interesting to the reader :—

"When the necessary funds shall have been obtained by subscription, it will be desirable to form an establishment in London, comprising a complete agricultural library, a museum for specimens of seeds, plants, &c., for models of implements, and, in all cases where it can be effected, for the implements and machines themselves, together with the means of trying them. To engage the superintendence of men eminent in the respective branches of science. To collect reports on foreign agriculture; to correspond with other societies, both at home and abroad. To refer, as in the French Institute and the British Association, papers on professed discoveries of acknowledged importance to select committees to investigate and report. To amass statistical information interesting to agriculture. To offer premiums for inventions, bearing some proportionate value to the expense to be incurred; or in certain cases defraying the cost of experiments, observations, and reports; and, above all, to communicate to the agricultural classes throughout the kingdom, by means of cheap publications, all matters of moment which shall have been submitted to the competent authorities of the Society, and which shall have stood the test of fair, rigid, and impartial experiment."

With respect to the adoption of the migratory principle of the Highland Society and the British Association, Mr. Handley urged that, although London should doubtless be the seat of direction, it "is probably not the spot in which the greatest number of practical agriculturists can be brought together to discuss or acquire information on subjects interesting to them."

"If, however, the annual meeting were held alternately at some considerable town situated in an important agricultural district—such, for instance, as York, Lincoln, Norwich, Bath, Northampton, &c.—not only would it be attended by a vast assemblage of gentlemen from distant parts who had communications to impart, and from others whose desire for information would induce them to be present, but it would excite a deep interest in the proceedings amongst a large class of resident yeomanry, who

would be induced to contribute their assistance, both by subscription and practical experience, and who, by adopting various proposed improvements, could, as it were, convert the district, containing probably many varieties of soils and different modes of culture, into a large experimental farm—an object so much advocated by some, but which I have always thought, on the necessarily limited scale on which alone it could be attached to an institution of this kind, would be impracticable in its operation and unsatisfactory in its results.”

The contents of this thoughtful and well-considered letter have been dwelt upon at some length, inasmuch as it contains the outline of the *modus operandi* afterwards adopted, and was doubtless published at the instance of Earl Spencer himself, in order to familiarise the agricultural world with the full scope of the organisation about to be set on foot.

No public steps appear to have been taken in the direction of organising the Society until the beginning of May, 1838, when the following advertisement appeared in the *Morning Herald* and elsewhere:—

“THE NEW AGRICULTURAL SOCIETY.”

“The undermentioned noblemen and gentlemen, having observed the great advantages which the cultivation of the soil in Scotland has derived from the establishment and exertions of the *Highland Society*, and thinking that the management of land in England and Wales, both in the cultivation of the soil and in the care of woods and plantations, is capable of great improvement by the exertions of a similar Society, request that those who are inclined to concur with them in this opinion will meet them To-morrow, the 9th of May, at the *Freemasons' Tavern*, at one o'clock, to consider the means by which such a Society may be established, and of the regulations by which it shall be governed.

“It is suggested that the Society shall be called ‘*The English Agricultural Society*,’ and that it shall be one of its fundamental laws that no question be discussed at any of the meetings which shall refer to any matter to be brought forward or pending in either of the Houses of Parliament.

“It is also suggested that the Society shall consist of two classes of subscribers—the one to be called Governors, subscribing annually 5*l.*; the other Members, subscribing annually 1*l.*—either the one or the other to be permitted to become Governors or Members for their lives by the payment, in one sum, of the amount of ten annual subscriptions.

“Gentlemen wishing to subscribe to this institution will be good enough to send their names and addresses to the editors either of the *Mark Lane Express* or of *Bell's Weekly Messenger*, specifying whether they wish to become Governors or Members, and whether they wish to subscribe annually or for life.

DUKE OF RICHMOND.
DUKE OF WELLINGTON.
EARL FITZWILLIAM.
EARL SPENCER.
EARL OF CHICHESTER.
EARL OF RIPON.
EARL STRADROKE.
MARQUIS OF EXETER.

LORD PORTMAN.
LORD WORSLEY, M.P.
HON. ROBT. CLIVE, M.P.
HON. BINGHAM BARING, M.P.
HON. C. C. CAVENDISH, M.P.
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RALPH ETWALL, Esq., M.P.	R. G. TOWNLEY, Esq., M.P.
H. HANDLEY, Esq., M.P.	W. WHITBREAD, Esq.
	HENRY WILSON, Esq.

This list of names is suggestive, not only of the great influence of Earl Spencer with the foremost men of the day, irrespective of their political leanings, but also of the ardour with which he must have pressed his views to a practical issue in the interval between his Christmas speech and the appearance of this advertisement. It is difficult to imagine a list likely to have greater weight with agriculturists, and it is not surprising to find that when the meeting was held on Wednesday, May 9, the room was "crowded to excess." The assembly was indeed a notable one. Earl Spencer and the Duke of Richmond were there, of course, with many others of their order, including Lord Chichester, a very popular landlord; Lord Portman, then in the prime of his manhood, who, though not spared to witness the Jubilee of the Society he helped to form, was to the last one of the most earnest of its supporters; Lord Stradbroke, who, till a comparatively recent period, was the veteran Lord-Lieutenant of Suffolk; with Lord Lyttelton, the Marquis of Tweeddale, Lord Oxmantown, Lord Eliot, Lord Hatherton, Lord Rayleigh, and others of high rank. There, too, was the great Sir Robert Peel, and, with him, another prominent statesman of the day, Sir James Graham, and many other Members of Parliament, including Sir Harry Verney, Bart. (now the only survivor of the meeting), Mr. Henry Handley, whose earnest advocacy has already been noticed, Mr. C. Shaw Lefevre, afterwards Speaker of the House of Commons, who died only the other day, full of years and honours, as Lord Eversley; Philip Pusey, who for so many years gave his best services to the Society as the Editor of its Journal; Mr. (afterwards Sir William) Miles, and Mr. J. W. Childers, staunch friends to the last; and a host of other members of the Lower House, including Sir E. Knatchbull, Bart., Sir E. Wilmot, Bart., the Hon. A. Dmcombe, the Hon. B. B. Baring, Alderman Copeland, E. Wodehouse, Col. Sibthorp, E. A. Sanford, R. A. Slaney, E. S. Cayley, Captain R. Eaton, J. H. Calcraft, H. C. Sturt, E. W. Pendarves, W. Williams, and others.

Earl Spencer was called upon to occupy the chair, on the motion of the Duke of Richmond, and told his plain unvarnished tale without any attempt at rhetorical display, simply attributing the honour of his position to "the knowledge he possessed of the subject, the wish he had to form the Society, and the steps he had taken for the purpose." He said that no one who looked about him amongst English farms could fail to see that there was room for great improvement, and a necessity for the diffusion of agricultural knowledge. By establishing a great and powerful Society, combining *science with practice*, and including amongst its members persons from east, west, north, and south, this knowledge might be diffused throughout the kingdom, and it was scarcely necessary to advance arguments to prove that the establishment of such a Society was desirable. In order to be really powerful in funds and influence, it was necessary for men of all parties to act together, and to accomplish this politics must of necessity be excluded. They had, therefore, suggested as a fundamental rule that nothing should be discussed at their meetings which should refer to any matter to be brought forward or pending in Parliament.

When the cheering with which this announcement was received had subsided, the noble Earl referred to a meeting of farmers held on the previous night at the Green Dragon, Bishopsgate Street, at which a resolution was passed declaring the proposed Society to be "delusive in principle, having a tendency to mislead the farmers of England and betray the interests of English agriculture, in so far as the principle of legislative protection to agriculture is disavowed in the fundamental resolutions," and boldly met this objection by stating that they did nothing of the kind, but claimed their right as Englishmen to form any Society they pleased, so long as it was legal and they thought they were doing good.

The Duke of Richmond, who followed, laid additional stress on the political neutrality at which they aimed, pointed in justification of their course to the success attained by the Highland Society, and concluded by moving the first resolution:—

"That it is the opinion of this meeting that a Society be established for the improvement of agriculture in England and Wales, and that it be called 'The English Agricultural Society.'"

This was seconded by Mr. Handley, who dwelt at some length on the objects to be attained by the application of science to agriculture; but before it was put from the chair, a Mr. Bell interposed, with an amendment affirming that the Society was "delusive in principle," whereupon great confusion

arose, a small section of the meeting encouraging the speaker by their cheers, whilst the majority of those present expressed their disapprobation. The Chairman, having pointed out that the requisition convening the meeting confined it to those who concurred with the promoters in the formation of the proposed Society, permitted Mr. Bell to proceed for a time, but he was at length called to order, and after several pertinacious attempts to gain a further hearing, the Chairman declined to allow him to proceed further. Thereupon Mr. J. J. Allnatt, who said that "he represented a considerable interest in the loyal county of Berks," took up the opposition, claiming his right to be heard at a public meeting; but Lord Spencer pointed out that this was an assembly of persons who concurred in certain principles, and that those who did not so concur had no business there at all. Further interruption ensued, and Mr. Allnatt said he should go back to Berkshire and tell the farmers that he had been refused a hearing; whereupon the Chairman characteristically retorted that he had not the slightest objection to his saying that he refused to hear him, for he (Earl Spencer) was well known to farmers, and they would form their own estimate of the statement. The Duke of Richmond rose to reply to certain of the objections that had been raised, whereupon some one called out, "Every independent farmer is going to leave the room;" and his Grace continued, amid laughter, "Then I will wait till they have done so." Some dozen persons then left the room, the disorder terminated, and the resolution was put to the meeting and carried unanimously.

The next speaker was Sir Robert Peel, who said that he had readily postponed the performance of public duties in order to be present, because of the deep interest which he took in the prosperity of agriculture; and expressed his belief that the establishment of the proposed Society would be productive of the most important benefits. Sir Robert warmly supported the principle of political neutrality, and proposed the second resolution, affirming—

"That it be a fundamental law of this Society that no question be discussed at any of the meetings of a political tendency, or which shall refer to any matter to be brought forward or pending in either of the Houses of Parliament."

This was seconded by Mr. C. Shaw Lefevre and adopted; after which Sir James Graham, who expressed the regret of Lord Stanley at his inability to attend the meeting, proposed a resolution that the Society should consist of two classes of subscribers—Governors and Members. This resolution having been seconded by Mr. Alderman Copeland, Mr. Webb Hall took

exception to the distinction between the words Governor and Member. The Chairman explained, however, that there was no intention to cast any slur upon anyone; that they required large pecuniary resources to make the Society effective; and that, although they might doubtless have secured a large capital by inviting unlimited donations, they preferred the proposal embodied in the resolution. After some further remarks the amendment was withdrawn, and the resolution was agreed to, as were also one (moved by Earl Fitzwilliam and seconded by Mr. Philip Pusey, M.P.) determining that annual meetings should be held successively in different parts of England and Wales; another (on the motion of the Earl of Chichester, seconded by Mr. E. S. Cayley, M.P.) for the appointment of a Provisional Committee to frame rules and regulations, and appoint officers, and to report to a meeting of the subscribers to be held at the same place on June 27; and a third (proposed by Lord Portman and seconded by Sir F. Lawley, Bart.) nominating all the Governors, together with the following gentlemen, as members of the said Committee, with power to add to their number:—Sir Harry Verney, Bart., Sir Richard Jodrell, Bart., Rev. J. R. Smythies, Messrs. J. Raymond Barker, Boyes, W. J. Cross, J. Ellman, T. Ellman, Green, G. Webb Hall, Halsted, Hillyard, Ide, J. Kinder, H. Gally Knight, C. Marshall, J. Paterson, E. Pell, J. B. Philips, Rusbridger, Sadler, H. Sadler, J. Tattersall, Thos. Weeding, Wilmot, and J. Wood. The final resolution (moved by Mr. E. A. Sanford, M.P., and seconded by Mr. J. Barneby, M.P.) appointed Messrs. Drummond as the Society's bankers. Lord Spencer then announced that he had received a letter from the Duke of Wellington regretting his inability to attend, and enclosing a Life Governor's subscription of 50*l.*; and this memorable meeting was brought to a conclusion by a hearty vote of thanks to the noble Chairman (in this case no formal compliment) on the motion of Lord Eliot, seconded by Mr. W. Miles, M.P.

The resolutions adopted at this meeting were duly advertised, and a notification was appended to the effect that before June 27 all persons might become members on payment of their subscriptions, but that subsequently members would have to be elected by the Committee. We have it on the authority of the late Lord Portman, in a letter addressed by him to the writer, that he himself was the first to pay in his subscription at Drummond's, and he therefore had some pride in regarding himself as the oldest member *de facto*.

But in the meantime the dissentient voices, which had disturbed the harmony of the proceedings just recorded, found

further utterance. It would seem that on relieving the meeting of their presence they adjourned to another part of the tavern, and there prepared a manifesto, which made its appearance in the *Morning Herald* the next morning, May 10, remonstrating against the action which they had found themselves powerless to resist, and stating that they had resolved on the formation of a Society to be called "The Farmers' Central Society of Great Britain and Ireland," whose objects were "the protection and encouragement of agriculture in all its branches, without reference to party political feeling." This manifesto, with its thirteen resolutions, seemed at first sight to give promise of some formidable opposition; but, as a matter of fact, the attempt was not long persisted in, and the Society ultimately resolved itself into what was practically a Protection Society, the abolition of the Corn Laws being at this time the leading question of the day.

It is clear from contemporary records that the success of the English Agricultural Society was never for a moment seriously imperilled by the operations of the Farmers' Central Society; and as there was no opposition from any other quarter, Lord Spencer and his coadjutors went steadily to work to develop the organisation they had founded, on the lines already laid down. Within a week of the inaugural meeting at Freemasons' Tavern no fewer than four meetings of the Provisional Committee were held. At the first, held on May 10, when the Committee assembled at the same place, there were present Earl Spencer (in the chair), the Duke of Richmond, Lord Portman, Hon. R. Clive, M.P., Sir Harry Verney, Bart., M.P., Sir F. Lawley, Bart., M.P., Earl of Euston, M.P., Philip Pusey, M.P., E. A. Sanford, M.P., C. Shaw Lefevre, M.P., J. W. Childers, M.P., E. W. Pendarves, M.P., R. Ettwall, M.P., Jos. Neeld, M.P., Col. Challoner, Rev. J. R. Smythies, Messrs. John Ellman, C. Hillyard, H. Sadler, T. Raymond Barker, W. Youatt, E. Pell, C. J. Tower, G. F. Heneage, T. Ellman, and G. Webb Hall; and a number of resolutions were adopted, including the following:—

"1. That this Society consist of a President, 12 Vice-Presidents, Governors, and Members.

"2. That the Society be under the management of a Committee, consisting of the President, Vice-Presidents, and fifty subscribers,¹ to be elected at the annual meetings, of whom twenty-five shall go out annually by rotation, but may be re-elected; and that all Governors have the power of attending all meetings of the Committee, but shall not have the privilege of voting, unless forming part of such Committee.

¹ At a subsequent meeting the Trustees were added to the Governing Body, and were also incorporated in the first resolution.

"3. That the President be elected annually, and that no person who shall vacate that office be eligible to be re-elected in the same capacity for three years."

Other resolutions appointed Earl Spencer as the first President, and Mr. Wm. Shaw (then Editor of the *Mark Lane Express*) as Secretary, the stipend of the latter being fixed at 200*l.* a year; determined that the annual general meeting should be held in London in the month of May, and that all elections of officers should take place thereat; and appointed the following noblemen and gentlemen as Trustees, subject to their acceptance of office:—The Duke of Grafton, Duke of Northumberland, Duke of Richmond, Duke of Sutherland, Duke of Wellington, Earl Spencer, Hon. R. Clive, Sir James Graham, Sir Francis Lawley, Sir Robert Peel, Mr. Henry Handley, and Mr. Joseph Neeld. Of these, the Duke of Wellington, Duke of Northumberland, and Sir Robert Peel declined, for various reasons; and the Duke of Rutland, the Marquis of Downshire, and Sir Thomas Dyke Acland, Bart., were elected in their stead.

The Provisional Committee next met on May 12, under the presidency of Earl Spencer, who was again supported by the Duke of Richmond, Lord Portman, Mr. Pusey, Mr. Sanford, Mr. Childers, Colonel Challoner, Mr. Hillyard, and Mr. Webb Hall; and there were also present Lord Sheffield, Sir R. Price, Bart., Mr. Handley, Mr. (afterwards Sir William) Miles, Rev. J. R. Smythies, Mr. H. Blanchard, and Mr. French Burke. It was then decided that the President and Vice-Presidents should be elected from the Governors; and the following comprehensive schedule, defining the objects of the Society, was resolved upon:—

"1. To embody such information contained in agricultural publications and in other scientific works as has been proved by practical experience to be useful to the cultivation of the soil.

"2. To correspond with agricultural, horticultural, and other scientific societies, both at home and abroad, and to select from such correspondence all information which, according to the opinion of the Society, is likely to lead to practical benefit in the cultivation of the soil.

"3. To repay to any occupier of land, who shall undertake at the request of the Society to try some experiment how far such information leads to useful results in practice, any loss that he may incur by so doing.

"4. To encourage men of science to the improvement of agricultural implements, the construction of farm buildings and cottages, the application of chemistry to the general purposes of agriculture, the destruction of insects injurious to vegetable life, and the eradication of weeds.

"5. To promote the discovery of new varieties of grain and other vegetables useful to man or for the food of domestic animals.

"6. To collect information with regard to the proper management of woods, plantations, and fences, and on every subject connected with rural improvement.

"7. To take measures to improve the education of those who depend upon the cultivation of the soil for their support.

"8. To take measures for improving the veterinary art as applied to cattle, sheep, and pigs.

"9. At the Meetings of the Society in the country, by the distribution of prizes and by other means, to encourage the best mode of farm cultivation and the breed of live-stock.

"10. To promote the comfort and welfare of labourers, and to encourage the improved management of their cottages and gardens."

At the third and fourth meetings of the Committee (on May 14 and 16) Lord Spencer was again at his post, various matters of detail were disposed of, and it was decided that thenceforth the Committee should meet every Wednesday at the same place. Amongst other matters brought before these early Meetings we find that on June 13 two letters addressed to Lord Spencer were read, in which the writer (Mr. Horn, of Carrondale, near Falkirk) proposed to lay before the Committee a plan of a machine for ploughing by steam, in order that they might report thereon, and offered to indemnify the Society against the cost of an experimental trial to the extent of 100*l*. On the 20th a letter was read from the Highland Society, welcoming the formation of the new Society, and expressing a desire for reciprocal information on matters of interest.

On June 26 the Committee recommended that the first country meeting should be held at Oxford on Wednesday, July 17, 1839; and the Duke of Wellington, Duke of Newcastle, Duke of Bedford, Marquis of Exeter, Earl Fitzwilliam, Earl of Chichester, Earl Talbot, Lord Portman, Lord Worsley, M.P., Lord Moreton (afterwards the Earl of Ducie), Sir Thomas Sherlock Gooch, Bart., and Sir Charles Morgan, Bart., were nominated as Vice-Presidents of the Society. Two of these (the Duke of Newcastle and the Duke of Bedford) declined the honour, and their places were subsequently filled by the appointment of the Duke of Northumberland and the Duke of Buckingham. The nomination of gentlemen to form the Committee of Management took place at the same meeting, and after some slight adjustment the list was completed as follows, the first being the only name which still retains its honoured position among the chief officers of the Society:—

Acland, Thos. Dyke, M.P.
Benett, John, M.P.
Barker, T. Raymond.
Blanchard, Henry.
Boys, Henry.
Buller, T. Wentworth.
Buller, Edward, M.P.
Burke, French.

Cayley, Edwd. S., M.P.
Challoner, Colonel.
Chapman, Thomas.
Childers, John W., M.P.
Curtis, Edw. B.
Elliot, Lord.
Ellman, John.
Ellman, Thomas.

Estcourt, T. H. S. B., M.P.
Euston, Earl of, M.P.
Flounders, Benj.
Hall, Geo. Webb.
Hayter, Wm. G., M.P.
Heathcote, John, M.P.
Heneage, Geo. F., M.P.
Hillyard, C.

Hobbs, W. Fisher.
 Grantham, Stephen.
 Johnstone, Sir John, Bt.
 Kimberley, George.
 Kinder, George.
 Lefevre, C. Shaw, M.P.
 Le Couteur, Colonel.
 Long, Walter, M.P.
 Miles, Wm., M.P.
 Pell, Edwin.

Page, W. Woods.
 Paterson, W. S.
 Pusey, Philip, M.P.
 Price, Sir Robert, Bart.,
 M.P.
 Sanford, Edw. A., M.P.
 Slaney, Robt. A., M.P.
 Smythies, Rev. John B.
 Spencer, Hon. Capt.,
 M.P.

Thompson, Harry S.
 Meysey.
 Verney, Sir Harry, Bart.,
 M.P.
 Warburton, Henry, M.P.
 Weeding, Thos.
 Whitbread, Wm. H.
 Wood, J.
 Wright, John.
 Youatt, Wm.

At the first General Meeting, held on June 27, the President (Earl Spencer), having taken the chair, congratulated the members on the present state and future prospects of the Society, and then called for the report of the Provisional Committee, which recapitulated the work of organisation recorded in the previous pages, and formulated a code of rules and regulations, mainly in accord with those subsequently embodied in the Royal Charter, to the effect that the Society should consist of a President, twelve Trustees, twelve Vice-Presidents, and of Governors and Members; and that the Council should consist of the President, twelve Trustees, twelve Vice-Presidents, and fifty other members. One General Meeting (subsequently altered by the Charter to two) was to be held in London every year, and one in the country in July or August—the first to be at Oxford on the day already fixed. The exclusion of political subjects from the Society's meetings was also embodied in a rule, subsequently enforced by the Charter, and the first list of officers (whose names have already been given) was presented to the meeting.¹ The Committee reported that there were already 186 Governors, of whom 65 were Life Governors, and 121 Annual Subscribers of 5*l.* each; and 280 Members, of whom 31 were Life Members, and 249 Annual Subscribers, making a total of 466; and, further, that the amount already received was 2,526*l.* 1*s.*, and 130*l.* expended, leaving a balance of 2,396*l.* 1*s.* in the hands of the bankers, Messrs. Drummond.

The President also read the following voluminous list to indicate the nature of the subjects which might be considered worthy of encouragement as topics for prize essays:—1. Best

¹ It must not, however, be supposed that these included all those who had been instrumental in the establishment of the Society. Amongst others who did not accept office, Viscount Howick (now Earl Grey) had many communications on the subject with various persons, especially Mr. John Grey of Dilston, Lord Spencer, and Lord Eversley. Earl Grey, in a letter addressed to the President on March 7, 1890, acknowledging his election as a Foundation Life Governor, says "that he took a great interest in the formation of the Society, and that it is gratifying to him to have observed that during its half century of existence it has more than fulfilled the sanguine hopes he entertained of its usefulness at the time it began its work."

Mode of Keeping Roots; 2. Subsoil or Trench Ploughing; 3. Transportation and Admixture of Soils; 4. Insects Prejudicial to Plants; 5. The Black Caterpillar; 6. Application of Mechanical Power; 7. Two-horse Ploughs; 8. Spring Food, Corn, Grasses, Vetches; 9. Rotation of Crops; 10. Best Mode of Analysing Soils; 11. Irrigation; 12. Plantations; 13. Underwood; 14. Varieties of Grain; 15. Economical Keep of Farm Horses; 16. Improved Rural Economy Abroad; 17. Stall Feeding on the Continent; 18. The Diseases of Plants; 19. Plough or Implement for Cutting Drains; and 20. New Implements; but the last two were noted as "not for essays." It should also be mentioned that at this meeting Mr. J. Benett, M.P., expressed a hope that the Society would acquire chemical apparatus, with an able chemist, for the purpose of analysing samples of soils sent to him, with a view to the adaptation thereto of suitable manures.

Thus, in less than two months from the first meeting at the Freemasons' Tavern, the promoters of the Society, by dint of earnest and almost incessant labour, guided by a discretion commensurate with their zeal, had succeeded in establishing this important national institution on a firm and enduring basis, with a handsome balance at the bank; had traced out the main lines on which the operations of the Society have since been conducted; and found themselves in a position to look forward with confidence to a long and prosperous future.

The Society having been formally constituted, it had reached what may be regarded as an experimental stage—hopeful, indeed, but still experimental; and it redounds greatly to the credit of its founders that the soundness of their judgment in the preliminary arrangements, although these were necessarily subject to modification, was attested by their success. We have it on the authority of the late Lord Portman that "in the formation of the Council care was taken to select members with varied experience," and every effort was made at the early Councils to bring the scientific and practical men into communication, and to combine their experience. When on one occasion a member who farmed his own estate, and considered himself as eminently a practical man, as distinguished from what he called the theoretical members, pressed his contention to discussion by moving an alteration in a proposed committee, which would have impaired the harmony of the Council, Lord Portman suggested that in truth the distinction was chiefly a verbal one, for "a practical man was a man who knew what was wanted, knew how to do it, and did it"—whereupon the objector subsided, and the division of the Council was avoided.

With a vast field of activity before them, the Council set vigorously to work, entrusting various branches of their operations to committees formed for the purpose; authorising an application to the Chancellor of the Exchequer for permission to make a selection from the books and papers of the extinct Board of Agriculture, the loan of which was subsequently accorded by the Treasury; recommending the offer of prizes (varying from 10*l.* to 50*l.*) for essays on no fewer than twenty-four subjects, including the improvements in Scottish agriculture since the establishment of the Highland Society, the preservation of turnips from the depredations of the black caterpillar, the simplest mode of analysing soils, the state of agricultural mechanics, the comparative merits of wheel and swing ploughs, the insects prejudicial to cereal crops, the formation and management of water-meadows, the best varieties and the diseases of wheat, the advantages of stall-feeding, subsoil ploughing, the rotation of crops, and so forth.¹ It was also determined to offer prizes of 50*l.* for the best draining plough, and 20*l.* for the best instrument for crushing gorse; prizes for a ploughing-match at the first country Meeting, to be held at Oxford in July, 1839; 30*l.* for the best cultivated farm in Oxfordshire and the contiguous counties; and "such amount as the Society might think fit to award" for the invention of any new agricultural implement.

By the end of July the stress of the preliminary business was over, the sum of 2,000*l.* had been invested in the 3½ per Cents. as a "nest-egg," and it was resolved that the weekly meetings of the Committee should be suspended for two months. But in the meantime overtures were made to the Royal Veterinary College to give a series of demonstrations on the structure, and lectures on the diseases, of cattle, sheep, and pigs, in the belief that this would effect as great improvement in the treatment of those animals as had already taken place in the treatment of the horse. The Society expressed its readiness to defray any expenses involved in this proposal, and, as it met with the cordial approval of the College authorities—although for a time it was not pursued with the ardour considered essential to the interests of agriculture—an annual subsidy of 200*l.* was promptly voted for carrying it into effect.

These matters formed the substance of a very satisfactory report for the next General Meeting, held in December, at which Lord Spencer (to whom the "marked thanks" of the Society were voted for his eminent services, on the motion of the Duke

¹ Several of these essays will be found in the first volume of the Society's Journal. Others were regarded as not of sufficient merit to be published; and in some cases there was no competition.

of Richmond) announced that it had been determined to publish a Journal of the Society's proceedings. The management of the Journal (the first number of which appeared in the following April) was entrusted to a committee; but its editorial control was vested in Mr. Philip Pusey, M.P., who for many years, until his death in 1855, was unsparing in his devotion to this most important department of the Society's operations.

The interval between this General Meeting and the next was mainly occupied in preparations for the forthcoming Meeting at Oxford, which was looked forward to with the greatest interest. The Duke of Wellington was invited to accept the Presidency on the termination of Lord Spencer's year of office; but his Grace declined on the ground that he was not practically engaged in agriculture,¹ and the Duke of Richmond was thereupon nominated as Lord Spencer's successor. Amongst minor matters for consideration were the Society's medal and the Society's motto. The former was entrusted to the celebrated Mr. William Wyon, R.A., whose designs were criticised and ultimately approved; the latter was the subject of much discussion. Various suggestions were made, but the question appears to have been referred to the judgment of Lord Spencer, and on March 27, 1839, the motto "Practice with Science," embodying the main principle on which his Lordship desired that the Society should be based, was resolved upon.

At the first Annual General Meeting, held on May 22, 1839, Lord Spencer was able to congratulate the Society on the fact that no fewer than 1,100 persons had enrolled themselves as members, whilst the capital invested had been increased to 3,000*l.*, and there was a balance of 1,196*l.* in the hands of their bankers. The annual income from subscriptions and dividends amounted to 1,663*l.*, but his Lordship urged the necessity of increasing this to at least 2,000*l.* a year, in order to carry out their objects. The Committee suggested the following as some of the heads under which the future labours of the Society might be conveniently grouped:—1. Classification of Soils; 2. Permanent Improvement of Soils; 3. Productiveness of Seeds; 4. Manure; 5. Rotation of Crops; 6. Stock; 7. Mechanics of Agriculture; 8. Diseases of Cattle and Plants; 9. Grass Farms; 10. Physiology of Agriculture.

It is clear, however, that the energies of the Society at this stage of its career were mainly devoted to the preparations for the historic Oxford Meeting of 1839: a meeting so interesting

¹ The Duke, nevertheless, manifested in various ways his interest in the Society's proceedings, and was occasionally seen at the weekly meetings held in its earlier years.

in its incidents and so important in the annals of agriculture as to deserve special treatment in a separate article.¹ Encouraged by the distinguished success of this Meeting, and by the gratifying support that the Society was receiving at all hands, the Committee resolved to petition Her Majesty the Queen for a Charter of Incorporation, and the President (the Duke of Richmond) was requested at the Committee Meeting held on February 5, 1840, to prepare a draft of the petition. On March 4, 1840, the draft petition was considered and approved, and the Duke was authorised to "take the requisite measures on the subject," which he appears to have done with such remarkable celerity that only two days later, on March 6, 1840, his Grace received a letter from the Marquis of Normanby, then Home Secretary, stating that the petition had been laid before Her Majesty, who had been pleased both to grant the Society a Charter under the title of the "Royal Agricultural Society of England," and to extend Her Royal patronage to it.

The Charter itself was sealed on March 26, 1840, and a Meeting of the Members of Council named in it was held on the 30th of that month, at which the President was requested to present at the next Levée an address of thanks to Her Majesty, conveying "the Society's humble and dutiful acknowledgment to Her Majesty for this permanent mark of Her Royal patronage of the Society and its objects." It was reported at this meeting that the Society then consisted of 82 Life Governors, 191 Governors, 122 Life Members, 1,972 Members, and 4 Honorary Members, making a total of 2,371 subscribers. It is a notable and gratifying fact that at the present time no less than 42 of these subscribers still remain, after a lapse of fifty years, on the Society's books. At the Council Meeting held on March 5, 1890, the last assemblage of the Council in the first half century of the Society's corporate existence, it was unanimously resolved to elect as Foundation Life Governors all these surviving subscribers of the English Agricultural Society, and the Members so elected appear in the List of Governors given in the Appendix to this number.

It is unnecessary to describe at any length the terms of the Charter. It recites that the founders had formed themselves into a Society for the "general advancement of English Agriculture," in order to prosecute the national objects already detailed on page 12, and declares that Her Majesty, "being anxious of promoting and encouraging by our Royal protection and patronage a series of objects which, prosecuted under the

¹ This it is proposed to publish in a subsequent number.

regulating principle of the exclusion of all those questions of debate on which the people of every individual country entertain sentiments so much at variance with each other, cannot fail to lead to results affecting in the highest degree the prosperity of our people and the national wealth of our kingdom," had authorised the petitioners to form themselves into one body politic and corporate, for the aforesaid purposes, under the name of the Royal Agricultural Society of England. The usual powers of suing and being sued, of holding lands, of framing by-laws and of appointing officers were granted, and the Charter ordered three General Meetings of Governors and Members to be held in each year, viz.: two in London in the months of May and December respectively, and the third "in such other part of England or Wales as shall be deemed most advantageous in time and place for the advancement of the objects of the Society."

Here for the present we may leave the young Society. Its subsequent career is told in the pages of the Journal, and forms a prominent feature of the agricultural history of the times. In the words of His Royal Highness the Prince of Wales at the banquet given by Her Majesty the Queen as President of the Society to the Council and Officers on March 26, 1889—"Throughout the whole of its life the Society has been constant to its original aims, so tersely summed up in its motto 'Practice with Science'; or, in other words, scientific inquiry brought to a practical issue in developing the resources of the soil and increasing its productiveness, in stimulating the improvement of live-stock and farm implements, and in bringing to early maturity animals which provide food for the people."

This brief summary of the Society's early history cannot be more fitly concluded than by a quotation from His Royal Highness's peroration in proposing the toast of the Society on the same memorable occasion:—

"Looking to all that the Society has achieved in fostering the practice and science of Agriculture, we are entitled to claim for it that it has nobly done its duty; and deserves well of the country at large. That it may prove in the future as active in well-doing as it has been in the past must be the earnest prayer of us all; and I am confident that we shall each and all of us strive to the utmost of our power to increase the Society's sphere of usefulness, and to do our part in 'the general advancement of English Agriculture.'"

ERNEST CLARKE.

FIFTY YEARS' PROGRESS OF BRITISH AGRICULTURE.

[TWENTY-FIVE years ago, Sir Harry Thompson summed up in the pages of this Journal the progress which agriculture had made during the quarter of a century which had then elapsed since the foundation of the Royal Agricultural Society. At the present moment, when the Society has just completed its fiftieth year of corporate existence, there are obvious advantages in recording in these pages a concise general survey of the changes which have taken place in the farming conditions of the country during a half-century of unexampled importance both to the agricultural community and the nation at large. As no one could possibly speak with so much authority on this subject as Sir James Caird, the Society is fortunate in having obtained his ready and cordial consent to revise for the purposes of the Journal his history of agricultural progress during the present reign.—Ed.]

FOR some years previous to the establishment of the Royal Agricultural Society, the prices of agricultural produce had been comparatively low, chiefly from a succession of seasons favourable to the wheat crop. The importation of foreign corn was then extremely small, and that of meat and dairy produce almost nothing. The Royal Agricultural Society of England was founded, as the English Agricultural Society, in 1838; so that the whole life and progress of that society has been co-existent with Her Majesty's reign. The question of Free Trade had not arisen. And, for seven years longer, the potato, the chief food reliance of the poorest of the agricultural class in Ireland and the north-west of Europe, continued sound.

The subjects which then seemed of chief interest to British agriculture are shown by the proceedings of the Committee of the English Agricultural Society soon after its formation in May 1838. Arrangements were made by them for annual agricultural shows of farm animals, implements of husbandry, and specimens of agricultural produce. Correspondence with similar societies at home and abroad was arranged. A veterinary school was projected. Prizes were offered for essays on agricultural subjects, and for experiments with manures. Reports were invited on the comparative advantages of different implements, on the management of water-meadows, on the best varieties of wheat for cultivation, on the keep of farm horses, on stall feeding of cattle, on rotation of crops, on subsoil and trench ploughing, and on the best system of land drainage. The first volume of the Journal of the Society was completed in 1840, most of the contributors to which—Philip Pusey, the leading

agricultural writer of his day, Earl Spencer, Sir James Graham, Henry Handley, M.P., Sir Edward Stracey, J. E. Denison, M.P. —have long since passed away; the only two survivors up to last year, each a nonagenarian, being Lord Eversley and Mr. John Dudgeon, the writer of the paper on Scotch agriculture, both since dead.

Mr. Pusey then estimated the quantity and value of the English wheat crop at 12,350,000 quarters.—worth, at 50s. a quarter, nearly 31,000,000*l.* The average produce he put at 26 bushels an acre, and pointed out the gain which would be made by the addition to that average of one bushel an acre. He further showed that an immense impulse, not only to increased production, but to the demand for labour, would arise by the expenditure of an additional 1*l.*, profitably made, on each acre of the cultivated land of this country. The average rate of produce has since that time risen two bushels an acre, by the poorest class of wheat land having gone out of cultivation. From fall of price, the money value of the 28 bushels in 1889 was only 5*l.* 5*s.* an acre, while that of the 26 bushels in 1840 was 8*l.* 2*s.* 6*d.*

Among the subjects which then engaged the attention of landlords and farmers, the application of special manures to crops was beginning to attract notice. Foreign bones to the value of 254,000*l.* were imported in 1837. Nitrate of soda was experimentally tried in 1839. Peruvian guano soon afterwards was introduced. In 1843 I grew an excellent crop of potatoes with it in the south-west of Scotland. The kind and mode of applying manure to each crop became the subject of scientific study and experiment. The Norfolk four-course system had shown signs of failure by the difficulty of getting good crops of turnips or clover when repeated every fourth year. In Flanders the skilful farmers, in view of this, had extended their rotations so that the same crop should not be repeated in less than ten, twelve, or fourteen years. Their more intensive system had led them earlier to notice this. Another question arose. Could no remedy be found for leaving the land idle during the nine months between the removal of the corn crop in August and the sowing of the turnip crop in the following June? To fill up the vacant time, rye was sown in the more southerly counties, which was eaten in its green state on the ground in May by sheep, as a good preparation for the winter green crop sown in June. And vetches followed later, to carry on the stock to the aftermaths from the hay, the vetches to be eaten on the ground as a good preparation for later turnips.

Economy of labour by machines was confined to a general use of threshing machinery on all large farms. Turnip-cutters were recommended as a saving of one-fourth of the crop when consumed in the field, and were coming extensively into use. Cake and corn crushers soon followed. But there was then no thought of reaping-machines or "reapers and binders," which are now becoming general.

In regard to live-stock, the investigations of the Royal Agricultural Society showed that the cost of feeding farm-horses varied immensely, as much as 50 per cent. within a few miles, from want of knowledge, economy, and care. The earlier maturity of certain breeds of cattle and sheep, such as the Shorthorn cattle and Leicester sheep, which were fit for the butcher a year earlier than most other breeds, was urged upon the attention of farmers as enabling them to supply the market with the same quantity of meat at 30 per cent. less cost. It was felt desirable that an extensive plan of inquiry and experiment should be encouraged and entered upon as the foundation for establishing some regular system. And to this object the labours of the Royal Agricultural Society of England, with those of the Bath and West of England Society, earlier established, and of local societies in most English counties, have since that time been unremittingly directed.

In Scotland, the Highland and Agricultural Society had long been established. The circumstances of that country had compelled a more careful personal attention by the landowners to the advancement of agriculture than had yet been felt by the more wealthy landowners of England. The law had placed upon the Scotch landowners the direct liability of finding the money for the public establishments of their counties, the churches, prisons, and police. They had the determination of questions of road-making, and, having to contribute directly a large proportion of the county expenditure, they actively controlled its administration. This brought them into closer business contact with the farmers than in England, and recent legislation has tended to increase this connection by the principle of imposing all county rates in certain proportions directly on landowners and farmers, and giving both a representation at the same county or parish board. There is thus a better fusion of the two interests than in England, and a readier appreciation on the part of the landowner of the outlays requisite on his part to enable the tenant to make the most of the land he farms.

In Ireland, the relation between landlord and tenant is very different from that of England and Scotland. Many of the

greater landowners are non-resident, and previous to the famine of 1846 the land was in a large measure in the hands of middlemen on leases for life, with leave to subdivide and sublet for the same time. These men had no permanent interest in the property; their business was to make an income out of it at the least cost, and their intermediate position severed the otherwise natural connection between landlord and tenant. The potato famine in 1845-46 prostrated the class of middlemen, and brought the landlords and the real tenants face to face. But the level which the latter had been permitted to obtain, and the practice being that the tenant made the permanent improvements at his own cost, led them to consider the landowner very much as only the holder of the first charge on the land; and they were in the habit of buying and selling their farms among themselves, subject to this charge—a course which, as a matter of convenience, was tacitly accepted by the landowner. He had security for his rent in the money paid by an incoming tenant, who, for his own safety, required the landowner's consent to the change of tenancy. This suited the convenience of landowners, the most of whom had no money to spend upon improvements, many of them non-resident and taking little interest in the country, and dealing with a numerous body of small tenants with whom they seldom came into personal contact. In the North of Ireland this custom of sale became legally recognised as tenant-right. The want of it in other parts of Ireland produced an agitation which ultimately led to the first Irish Land Act of 1870, and, ten years later, to the establishment of a Land Court with power to fix the rent. Circumstances have thus brought about a situation in which the landowner cannot deal with any freedom with his property, either in the selection of tenants or in the readjustment of rents. And this has arisen, in a great measure, from the neglect by the landlord of his proper duties, in not himself executing those indispensable permanent improvements which the tenant was thus obliged to undertake, and who in this way established for himself a co-partnership in the soil itself.

The general progress of agriculture in the United Kingdom was suddenly interrupted by the appearance of the potato disease, which, after a warning in 1845, spread over Western Europe with destructive force in 1846, suddenly laying waste the produce of vast tracts of country, and rendering desolate those poor and populous districts which had become dependent for their food on this hitherto prolific root. Ireland, especially the western and southern counties, where the poor population had little else to subsist upon but potatoes, was completely

prostrated. In the worst unions in these counties, twelve out of every thirteen people were wholly dependent on the potato for their food. In a single week, in July 1846, the promise of the potato crop was, by a mysterious blight, destroyed. A sudden fear fell upon governments, both here and on the Continent, when they began to comprehend the true nature of the calamity. The late Sir Robert Peel, then Prime Minister, instantly made arrangements for the purchase in America of large supplies of Indian corn, to be immediately shipped for Ireland, the part of the kingdom in which there was the most pressing danger. Then followed the repeal of the corn laws, which saved us from the insurrections that rapidly spread on the Continent, changing dynasties and unsettling governments.

With the failure of the potato the agricultural system in Ireland collapsed. The people, no longer able to trust the potato, ceased to 'conacre,' that is, to hire land from the neighbouring farmers as potato gardens; the farmer, deprived of conacre labour, had no money to pay wages in cash, and his land became unproductive; the landlord found his rent disappearing, while a new order of things grew out of the confusion.

To prevent the fearful consequences of famine, immense sums were advanced by Government for the employment of the people of Ireland in relief works. These were administered by the grand juries, on the understanding that the money so advanced was to be expended in reproductive works, and to be repaid to the Government by instalments in a limited number of years. The pressure was so great that it was found impossible to control the expenditure in such a manner as to make it reproductive; and vast sums were squandered on works which could never be of any other value to the community than that of finding employment and wages for the starving people for a time.

The potato famine, and the consequent free import of foreign corn and provisions into this country, mark an important epoch in our agricultural history. The gold discoveries in California and Australia happening about the same time gave a rapid stimulus to enterprise and improvement in every branch of business, including that of agriculture. In 1850 and 1851 it was my duty, as commissioner for the *Times* newspaper, to undertake an inquiry into the state of agriculture in England in a time of great agricultural depression. On looking back on that time, and comparing it with the present, there was great depression then, but more hope than at present. Wheat is now (1890) much lower in price than it has ever been for one hundred years.

In July 1851, the Prince Consort, speaking at a banquet at the Mansion House on the opening of the first great International Exhibition, pointed to the duty of every educated person closely to watch and study the time in which he lived, in order to add his mite of individual exertion to further the accomplishment of the ordinances of Providence, the foremost of which he described as the realisation of the unity of mankind. The products of all quarters of the globe were placed at our disposal, and we had only to choose which was the best and cheapest for our purposes, while the powers of production and distribution were entrusted to the stimulus of competition and capital. The Exhibition of 1851 was to give a true test of the point of development at which mankind had arrived, and a new starting-point from which to direct their further exertions.

The three preceding years had been eventful for British agriculture. Protection duties had ceased, and the landlords and farmers of this kingdom, no longer permitted to lean on an artificial support, had now to rely on their own energy and skill. In 1851 the new starting-point had been reached, and with energy and vigour the task of increased production, to compensate for diminished prices, was begun. It has since progressed, not so much by surpassing the best farming practice of that time, as by a general advance throughout the country, leading up to that higher example.

An unusual lustre was thrown on the meeting of the Royal Agricultural Society in 1851. Men from all quarters of the world flocked towards happy England to the International Exhibition, to see with their own eyes what it was in our institutions or our race that had raised this country, with its narrow boundaries, to the proud position which she held among the nations. The Royal Agricultural Show of this year was held on the playing-fields of Eton on the banks of the Thames, beneath the walls of Windsor Castle, the abode for many centuries of the sovereigns of England, over which floated the Royal Standard of the Queen. At no previous meeting of the Society had there been so great a concourse of spectators, so fine a field for the exhibition, or such excellent specimens of all the best breeds of live stock in England. And never before could their peculiarities be studied with greater advantage. On the third day of the meeting the gathering of people, favoured by the beautiful weather, was immense. What a contrast did these British breeds present in the eyes of many of the foreign visitors to those to which they were accustomed at home! The sleek and contented Shorthorn, the more sprightly faced Hereford, the handsome Devon, had a placidity and easy, well-fed

satisfaction about them, which spoke of the green fields of England, and must have puzzled a Hungarian magnate, accustomed to his vast droves of white lean cattle, roaming for miles over the sometimes parched plains of the Teiss, in search of their scanty pasture. Not less astonished was the German flockmaster, familiar with his fine-woolled but scraggy-looking sheep, when he saw the matchless symmetry of the Southdowns.

From the new starting-point in 1851, when the best farming was exceptional, there has been little advance from the best practice then reached. Drainage was well understood and was rapidly extending. The use of purchased manure and linseed cake, in addition to the manure of the farm and its green produce, was spreading slowly in the better-farmed districts. Bone manure had a well-established reputation, especially in dairy counties. Peruvian guano and nitrate of soda, wherever tried, were found a most useful mode of promoting growth and increasing the bulk of the crop.

And the literature of agriculture was not found wanting. Foremost of all were the most readable and practical essays of Philip Pusey, in nearly every number of the *Journal of the Royal Agricultural Society*, the embodiment of that Society's motto, "Practice with Science." From week to week, up to the present time, the pages of the *Agricultural Gazette*, edited till his lamented death, from its commencement forty years ago, by John Chalmers Morton, have poured forth from the experience of practical farmers a continuous flood of knowledge and light upon every subject connected with agriculture. The famous experiments of Sir John B. Lawes, at Rothamsted, as described by him and his scientific assistant, Dr. Gilbert, in the pages of the *Royal Agricultural Society's Journal*, from year to year, have formed a guide to improved practice in this country, both with crops and in the feeding of live stock.

The train was thus laid for a rapid extension of the best practice in all parts of the country, when the strong motive-power of personal interest should come into play. In 1850 and 1851 the price of wheat was 39s. 4d. a quarter, and of salt beef and pork, 36s. a cwt. From that time prices began to rise, and continued to do so with slight exceptions till 1874. The price of wheat, meat, and dairy produce, many times between these dates, reached an increase of from 50 to 60, and in more than one instance 100 per cent., above that of 1851. The price and rent of land rapidly increased in the same period, and a great stimulus was given to land improvement, and to the extension of the best agricultural practice. Earlier maturity in perfecting cattle and sheep for the market, by good feeding from their

birth, added probably a fourth to the weight of home-grown meat during the period of good prices. Landlords and farmers shared in the general prosperity, and the wages of labour and the bills of tradesmen increased in like fashion.

There are two capitals employed in British agriculture, that of the landowner and that of the farmer. The first, which is the land itself, and the permanent improvements upon it, had hitherto been certain and safe, and therefore yielding a small, but regular, return; the other, the live stock and crops, subject to risk of seasons, and speculative, and liable to competition prices, requiring a much larger percentage to cover risk. The capitalist is content with 3 per cent. for his heretofore secure investment, which carried with it also influence and social position. A farm worth 50*l.* an acre for the freehold needs a further 10*l.* an acre to provide the farmer's capital for its cultivation. The landowner is satisfied with a return of 3 per cent. on his 50*l.*, while the tenant looks for 10 per cent. for management and risk and capital, on his 10*l.* Let us suppose that the farmer has a capital sufficient to buy 100 acres at this price, and stock them; he would get for his 5,000*l.* invested in freehold, 150*l.*, and for his 1,000*l.* farm capital, 100*l.*; together, 250*l.* But if he followed the custom of this country and used the whole of his capital in cultivating another man's land, he would with his 6,000*l.* hire 600 acres, on which his return ought to be 600*l.* He in truth then trades on the capital of the landowner, practically lent to him at the moderate rate of 3 per cent., which he converts into a trade profit on his own capital of 10*l.*

The British landlord is thus the nominal owner of five-sixths of the joint capital embarked in agriculture, and upon him in the end the chief weight in any disaster must fall. But while his ownership is hampered by entail and settlement he cannot use his position with the freedom of absolute ownership, and is thus disabled from bearing his share of the strain that is now pressing on the land. The Settled Land Act of the late Lord Cairns has been a partial relief. But it is only by fee-simple ownership that a landowner in difficult times, such as the present, can do justice to his estate and his tenants.

In regard to tenants, recent legislation in England and Scotland might have proved highly beneficial if its effect had not been practically limited to the "quitting" tenants, and thus to that portion of them, not one-tenth in number, who may be described as either the old, or the least prosperous and persevering of their class.

The hopes excited by the expressed intention of the Prime

Minister, Mr. Gladstone, in 1881, to deal with the devolution of land, the transfer of land, the registry of land, and the mode of borrowing on land, all disappeared under the pressure of the Irish land question. It has been assumed by an influential class of politicians that the agricultural system in that country can be rendered sound and prosperous by the conversion of the landlord and tenant system into that of cultivating ownership. And the main part of the time of the Legislature, so far as the land is concerned, has since been engaged towards that object, to the exclusion of those questions which so pressingly affect the welfare of the agricultural interests of Great Britain.

It would, however, be a great error in regard to British agriculture, whatever may be the final decision in regard to Ireland, to take any legislative step which should tend further to alter the well-recognised rule that the landlord makes all the permanent outlays required, and the tenant finds only the capital for cultivation. And it would be an equally mistaken policy to take any course which should diminish the landowner's interest in the continued improvement of his property. The landowner in this country has two capitals in the land: the soil and all that is beneath it, and the buildings and other permanent works made by his capital upon it, and required for the accommodation of the people and the stock and crops of the farmer. On good agricultural land, worth 50*l.* an acre, the land will represent 35*l.* of that value, and the buildings and other permanent works 15*l.* It is seldom that the farmer can command more capital than is needed for that fuller cultivation which our exposure to foreign competition demands. It is therefore most important that such measures should be devised as will best tend to the continuous increase of production, by giving a distinct but united interest to both landlord and tenant in obtaining that result. The experiment being tried in Ireland of Government advances to tenants for the purchase of their farms might, however, with great advantage be offered to the farmers of Great Britain. This might be done with the view of increasing the proportion of occupying landowners, and might be limited to those occupiers who were prepared to pay down one-fourth of the price.

After 1874 agricultural prosperity began to wane through an unprecedented series of bad seasons. In eight seasons, ending in 1882, there were only two good crops, and among the bad was the crop of 1879, the worst of this century. During this period much agricultural capital was lost. And there was no compensation by higher price, for the loss of crops in Western Europe stimulated in an extraordinary degree the extension of

wheat-growing in the United States of America. They had productive years when the crops were deficient here. In a single year they increased their wheat acreage by an extent equal to our total growth. In the twenty years from 1860 to 1880 their production of wheat rose from twenty to sixty million quarters. They could not have found an outlet for it but for the most rapid increase of railroad communication with which it was accompanied, and the increased demand from Western Europe. The cost of transport fell from twopence per ton per mile to a farthing. The distance from which wheat could be conveyed was thus increased eightfold. And as a ton of meat or provisions is six times the value of a ton of corn, and as these are yielded by the land in about that proportion, the produce of six acres in the form of meat or provisions can be transported as cheaply, so far as weight is concerned, as that of one acre of corn. This formidable and growing competition in both corn and provisions we must now reckon with.

The long-continued period of bad crops and low prices, added to the losses of live stock, especially sheep, in the wet cold seasons by disease, had reduced the capital of the farmers in this country by 30 to 50 per cent. when the collapse of prices, beginning in 1875, fell upon them. Their gradual but growing poverty had for several years forced them to discontinue outlays in the maintenance of the condition of their farms. The poor clay lands are going out of cultivation. In the corn counties much of the land is in this position, and considerable tracts being without tenants are farmed by the landowners. Large reductions of rent have been made, and where land has from any cause been pressed for sale, the price has fallen greatly. At no period of the existence of the Royal Agricultural Society has there been such depression in the interests of agriculture as now prevails.

On the other hand, never has there been a time in which every article of food has been so plentiful and cheap. In the earlier years of the Society's existence the home and foreign supply of wheat was in the proportion of two-thirds home-grown and one-third foreign. In 1851 the whole supply afforded 317 lb. per annum to each of a population of 27,000,000, which at the average price of the previous ten years of protective duties amounted to 53,500,000*l.* But the total supply of 1889 gave 400 lb. per head to a population of 37,500,000 at a cost of 43,700,000*l.* Not only were our people, 10,500,000 increased in number, fed with bread at a diminished yearly cost of nearly 10,000,000*l.* sterling, but each individual had an additional supply of one-fourth beyond that of 1851.

The supply of animal food in 1889, as compared with 1851, increased in still larger proportion. The quantity to each individual of the increased population was 115 lb. per head for the year 1889, as compared with 90 lb. per head in 1851. This is an increase of nearly one-third to the supply of each person, the main part of which increase has come from foreign countries. A result so beneficial in the supply of bread and meat to our ever-increasing population must render any return to protective duties on food in this kingdom impossible, so long as that increase is maintained by the other successful industries of the country.

These increased supplies are coming yearly in larger proportions from the great colonies and possessions under the dominion of the Queen. The supply of wool from Australia and other British possessions comprises nearly four-fifths of the 650 million pounds grown in this country and imported annually, nearly one-half of which is again exported to the Continent. Of the foreign supply of meat the United States still furnishes much the largest proportion. But, by the refrigeratory process now successfully introduced, more than a million carcasses of sheep are already yearly brought to us from New Zealand, and laid down in excellent condition in London, at a cost for killing, packing, cooling, and freight, of $2\frac{1}{2}d.$ a pound, which on mutton of such good quality leaves, from the price here, a reasonable profit in the difference of the value of the carcass there, and here, to the importer. And as there is a marked decline in the sheep stocks of Western Europe, and no probability of much increase in North America owing to the costly keep indoors during the severity of the winter climate, it is satisfactory to the British consumer that he has the prospect of increasing supplies of good mutton from his brethren in Australia and New Zealand.

The agricultural experiments of Sir John Bennet Lawes, which have been continued for more than forty years, have clothed "Practice" with "Science," in many points on which the British farmer was groping for knowledge. These experiments have been made on land on his estate of Rothamsted, in Hertfordshire, always accessible to the agricultural inquirer. The results have been published annually, and the farm itself, with every detail of the work both in the field and the laboratory, has been laid open to public inspection and criticism. Wheat, barley, and oats have been grown under a variety of manures, plots with no manure being in every case reserved for comparison. Root crops, including potatoes, have been added. And in 1856 an important series of experiments was commenced

on grass land, which, with very little change on each of the twenty plots, has been continued to the present time. The experience of the past thirty years shows that the natural produce of grass may be doubled, and even trebled, by the continuous use of special manures. As two-thirds of the cultivated land in this country, and all the permanent pastures, are in grass, this series of experiments is of very great interest and value.

"It is quite certain," says Sir John Lawes, "that arable soils are poorer than the pastures from which they are frequently derived, and that their fertility must be restored to them before a fresh pasture can be said to be re-established. It is the cost of this operation that has given rise to the saying that 'laying land down to pasture breaks a man.' The question is whether some of the cost incurred cannot be saved. There is plenty of foul land in the country upon which the experiment might be made. And I should be disposed to advise those who have the misfortune to own such land at all events to try whether the superior grasses, when aided by manure, will not be competent gradually to drive the weeds out of the soil."

In the wheat experiments it is not surprising to find, after forty successive crops, that the soil begins to exhibit signs of exhaustion. This has been corrected by interposing a heavily-dunged green crop; while the introduction of red clover, at long intervals, between the corn crops is also found to add greatly to the corn-producing power of the soil. To attain a maximum-paying produce Sir John Lawes finds that the land should be dunged heavily for mangel, to be followed with wheat, or barley, or oats, for several years in succession; then interpose clover, and follow it with corn crops, keeping the land perfectly clean, and manuring all the corn crops with nitrate of soda and superphosphate. When the land shows need of change, begin again with heavily-dunged green crops. Successive crops of barley he finds to pay better, and they are more certain in his climate, Hertfordshire, than either wheat or oats, and give more corn in proportion to straw. If a heavily-dunged green crop is introduced, it is not necessary for a further succession of years to give any other manure to the corn crops than nitrate of soda and superphosphate. Potash (which may be supplied by dung) is very necessary in a grass manure, especially for clover, which, unlike corn, is injured by ammonia. The grass experiments show that by giving food to the plants, the strongest and best varieties appropriate what they most need, and by the law of the strongest put the weaker down. In the best plots the weeds almost disappear, while on one plot to which no manure is applied the weeds form 50 per cent. of the produce.

In the same direction the Royal Agricultural Society of England some years ago commenced a series of experiments on the growth of crops and the fattening of live stock with special relation to the manures applied and the food used, and to the effect of the manures resulting from specific kinds of food. The Duke of Bedford, with great liberality and public spirit, has placed suitable land and buildings at the disposal of the Society, whose Council, under the guidance of their scientific officials, regulate and superintend the experiments. The whole is open to public inspection, and the results are carefully elaborated and published in the *Journal of the Society*.

A most useful class of agricultural improvements has been the introduction, during the Society's existence, of improvements in the seeds of the various kinds of corn and vegetables, as well as the earlier maturity and improved character of the live stock. By careful selection, and more recently by hybridisation, improved varieties of wheat, barley, and oats have been introduced with much success, and the same with potatoes, mangel, and other vegetable crops. The improvement in sheep and cattle is even more conspicuous. Probably one-fourth in weight of meat brought to market has been added in these fifty years by the earlier maturity of our live stock. What was exceptional then has now become general. The quality of seeds of all kinds, and of sheep, cattle, and horses, in all parts of the country has greatly and generally improved.

In regard to farm implements, the most certain gain has been in the introduction of the reaping and mowing machine. This machine, originally the invention of a Scotch clergyman, was for many years neglected in this country, but was, in 1834, improved and perfected by Mr. McCormick in the United States, where the crops of vast plains of wheat could not otherwise have been handled from want of labour. In 1848, 700 of the McCormick reapers were sold in America, and the annual sale had grown to 50,000 in 1884. Again introduced in this country in recent years, when difficulties arose between employers and labourers, the use of the reaping machine made by the leading implement-makers of England rapidly spread, being constructed in this country to meet the requirements of much heavier crops than those in America. The farmer now reaps and gathers his corn at a great saving of cost, and in the knowledge that at the most critical season he is able to secure his crops with little outside help. Sheaf-binders attached to the machine are successfully coming into use.

The steam cultivator, first invented by the late John Fowler, of Leeds, and much improved by his successors in the business,

has been largely employed, but as yet more as an auxiliary than in superseding the ordinary working stock of the farm. It is invaluable in enabling the farmer to overtake the preparation of his land for crops during favourable weather; and where deep ploughing is required to bring up fresh and to bury exhausted soil, no implement can effect the object so cheaply and expeditiously. But it is a costly implement, and, except on large farms of heavy land, it is more prudent for the ordinary farmer to hire, when he requires it, than to purchase.

The variety of implements and machines now used in English agriculture will be understood from the fact that the number of such articles exhibited at the last Show of the Royal Agricultural Society at Windsor exceeded 7,400. Many of these were in use in the early years of the Society, but additions and improvements are every year being made to them.

Within recent years the system of storing, in silos or stacks, green grass or fodder of any kind has been successfully introduced. In wet seasons for hay-making this practice is found very convenient, and, though the nutritive quality of the grass is not increased, it may be safely preserved in this way in such seasons. Coarse grass which could not otherwise be utilised can by this process be turned to good account. It is claimed as especially useful on dairy farms, as winter provender for cows in milk, when green food cannot otherwise be profitably grown.

The future of the landed interests, and of the public in regard to the supply of food, may be briefly considered. There are good signs of returning activity in trade, and with a population increasing at the rate of nearly a thousand a day, there must be a growing increase in the consumption of bread and meat. Bread was never more plentiful and cheap, and any return to the prices that ruled twenty years ago can neither be expected nor hoped for, seeing the vast change and economy in the cost of transport and the ever-widening fields of colonial and foreign production. In the last ten years the growth of wheat in this country has declined 30 per cent. It has a wider climatic range of growth than any other cereal. Other kinds of corn remain much as before. Barley, except the fine malting quality, meets with severe competition from Indian corn, which, in its various uses, prevents any considerable rise of price in barley. Oats, which are still largely grown in Scotland and Ireland, seem likely to maintain their place. The dairy and market-garden system, fresh milk and butter, veal and lamb, beef and mutton of the finest quality and early maturity, vegetables, and hay and straw are every year enlarg-

ing their circle around the seats of increasing populations. These are the articles which can least bear distant transport, and are therefore likely longest to withstand the influence of foreign competition. The refusal to admit live cattle or sheep from any foreign country where cattle disease is known to exist has proved of the utmost value as a sanitary precaution. As the result of lower prices, the poor clay soils, which are expensive to cultivate and meagre in yield, will be gradually all laid to grass, or be planted, and the poorer soils of every kind, upon which the costs of cultivation bear a high proportion to the produce, will follow the same rule of necessity. During the last twelve years the permanent pasture in this country has from this cause been increased by more than two million acres, upwards of 10 per cent.

The consumption of food in this country has increased not only in proportion to the increase in the numbers of the people, but also with the hitherto augmenting scale of wages. Fifty years ago the agricultural labourers rarely could afford to eat animal food more than once a week. Of late years some have had it every day, and, as the condition of the rest of the people has improved in a greater degree, the increased consumption of food in this country has been prodigious. In addition to the whole of our home produce, we are importing this year probably 140,000,000*l.* worth of foreign food. If this goes on at the same progressive rate for the next twenty years, we may look forward with confidence to adequate supplies, at moderate prices, from the fertile soils of the Queen's colonial possessions in Australia, India, and North America, besides what may come from foreign countries.

British agriculture is now undergoing the most severe trial to which it has yet been exposed. In 1851, when concluding the inquiry made by me in that and the previous years into the state of agriculture in the English counties, I referred to education in its widest sense as the most powerful aid in its further progress. Knowledge—of their business and true interest by the landlord and the tenant, and of the best mode of promoting his own welfare by the labourer—was then the first requisite towards an improvement of their condition. The tide of prosperity had begun by the recent gold discoveries of California and Australia, and it continued to flow for the next twenty-five years. During that period, from the greater prosperity of the people and the increased consumption of agricultural produce, the capital value of the land and of the live stock and crops upon it was increased by four hundred and forty-five millions sterling. The measures of a public character, required in

addition to those within the power of individual landlords and farmers, have to a considerable extent been accorded by the Legislature. The Settled Land Act and the Agricultural Holdings Acts in Great Britain, with the Land Acts in Ireland, mark a great advance in land legislation. But one of the most important, that of cheapening and facilitating the transfer of land, has still to be undertaken.

Much of the increase of capital value of the land, up to 1874-76, has since that time been lost, first by a series of bad years unprecedented in their continuance, causing not only diminished crops, but also heavy loss in the live stock through the wet and unhealthy character of the seasons. The subsequent collapse of prices, which took place in 1885, falling as it did upon an agricultural class already impoverished, has greatly disheartened both landlords and tenants, and has seriously crippled their power to give employment to their labourers. Its effects are at the same time felt among the tradesmen in the country villages and towns, whose business is dependent on the spending power of the country squires and farmers. It is a remarkable fact, illustrative of the change of the agricultural system, naturally brought about under the influence of foreign competition, that the home production and value of wheat in England and Wales at the end of fifty years of the existence of the Society, which, at the commencement, was estimated by Mr. Pusey at 13,500,000 quarters, worth 31,000,000*l.*, will not, in 1890, exceed one-half of that quantity, and be worth not much more than one-third of it in value. This clearly explains the great fall in the rent of the wheat lands in this country, especially those of the heavier class in the counties on its eastern side.

These islands are, indeed, becoming every ten years less agricultural and more pastoral. In the last twenty years three million acres, nearly one-seventh of the land under rotation, have been added to the permanent pasture. This change is likely to go on, as only the better class of lands can compete successfully with the products of rich and unexhausted soils now brought so cheaply to our shores. We have still an advantage over these in the cost of transport, which is nearly equal to the rent here. And, to that extent, British agriculture on the good land should be able to hold its own. But the poor clay soils, which are expensive to cultivate and small in yield, and the poorer soils of every kind will be gradually laid to grass, or be planted for timber. The climate is admirably adapted for grazing. If our manufactures and mines continue to maintain a successful competition with other countries, and

if our population, increasing at the rate of one thousand a day, besides contributing largely to our colonies, can find adequate employment at home, there will still be a remunerative market for that description of agricultural produce which can least bear the risk and cost of carriage from distant countries.

It is well that we should remember that every requisite of food and clothing is an annual product of the earth, yielded no doubt to a large degree in proportion to the ingenuity and industry employed on it by man. But when man has done his utmost the result is determined by influences beyond his control. Of those substances on which life and health day by day depend, there is every year a new production, directly or indirectly of vegetable growth, and dependent year by year on the sun and rain in due season. From 1854 to 1865 there were ten good harvests in England, and only two below an average. This covered the whole period of Lord Palmerston's successful administration. During these twelve years we had to bear the burden of the Crimean War, followed by the Indian Mutiny and the increased military expenditure begun in 1860. Can it be doubted that such a run of propitious seasons aided the gifted Minister who then conducted the finances of this country to meet successfully our vast expenditure, not only without serious pressure on the people, but with largely increased development of their industry and resources?

In the fiftieth year of its existence the Royal Agricultural Society was honoured by the gracious acceptance by the Queen of the Presidency for that year. And again at Windsor, but on a more spacious field than in 1851, when the lamented Prince Consort presided, the Show was held in the Great Park. Nothing could exceed the fitness and beauty of the situation, or the kindness of the weather. Never before have the comfort of the splendid animals, and the facilities for their examination, been more carefully provided. The arrangements were so well considered that the spectators were able leisurely to examine all classes of animals, and all the various implements for cultivating the soil. No hitch of any kind occurred. Her Majesty honoured the Show by three visits on successive days, amidst the most loyal and hearty acclamations of her people, sovereign and subjects thus bringing to a happy and successful conclusion the fiftieth year of the Royal Agricultural Society.

JAMES CAIRD.

NOTES ON AGRICULTURAL EDUCATION AT HOME AND ABROAD.

At the meeting of the Council of the Society held in February last, allusions were made to certain suggestions on the subject of Agricultural Education, which had been thrown out by members at the half-yearly general meeting held in the previous December. Since that meeting of the Council I have had an opportunity of reading the Reports on the State Agricultural Departments of foreign countries which were laid before Parliament by the Foreign Office in August 1889. At the present moment, when the business of our own Board of Agriculture is not definitely settled, it may be a matter of interest to notice what is being done by similar departments in other countries.

The first point which I think comes prominently into view is, that in nearly all countries except our own, almost every movement with respect to agricultural development seems to be originated and carried into execution by a department of the Government. These departments have a very wide field of action: they have under their care not only agricultural education, but also statistics, scientific and practical experiments, breeding studs, forestry, mines, game licenses, fisheries, and indeed almost everything that can by any possibility be connected with the soil of the country.

I propose to look at some of these Reports, especially with reference to two suggestions that were submitted to the Education Committee of our own Society: (1) That more should be done by the Society for the advancement of agricultural education. (2) That the Society should institute or encourage a system of travelling lecturers for the instruction of farmers.

We may fairly ask, What has the Society done hitherto in either of these directions? The question has constantly been before the Council—Mr. Chalmers Morton, Mr. Holland, and Mr. Randell, on many occasions presented with great force their views, viz., that the Society should itself initiate and develop schemes for the technical education of the farmer and the labourer. On the other hand, Sir Harry Meysey Thompson, the present Sir Thomas Dyke Acland and others, held the view that what was most required amongst the labourers and smaller farmers was not so much technical as general education—that a number of boys were constantly being sent out from our country schools so poorly grounded in general knowledge that they were quite unable to avail themselves of any higher scientific teaching.

Ultimately, both parties, I think, considered that the Society

could not provide teaching power, but that it might undertake the task of examining those who had received their education elsewhere; and that, by prizes and certificates of merit, it could recognise the knowledge otherwise acquired. The result has been that the Council has dealt with this question tentatively and in a spirit of compromise. To promote higher or scientific agricultural education, the Senior Examinations were instituted in July, 1867 (the first examination taking place in April, 1868), when money prizes and certificates of merit, together with the life membership of the Society, were offered as rewards to successful competitors. These examinations have now, with slight modifications, been held for twenty-two years. They are searching in character, and require a high standard of attainment in the science (chemistry) and practice of agriculture, bookkeeping, land surveying, and agricultural engineering; while botany, geology, agricultural entomology, and anatomy, are subsidiary subjects. Out of 237 candidates who have presented themselves, 61 have gained first-class and 30 second-class certificates. Amongst these, students from Cirencester, Downton, and other agricultural institutions have distinguished themselves, and the honourable certificates of the Society have been carried off by English, Scotch, Irish, and Indian subjects of Her Majesty, and at least on one occasion by foreign students. To show how very little there is of scientific teaching of agriculture in England, it may be remarked that the majority of the successful competitors are from one college, and there are comparatively few candidates from any other source.

In 1873, a desire was expressed to encourage the attendance of farmers' sons at the county schools, which were then generally being established, and it was thought that in those schools both general education and specific teaching in agriculture might be combined. To promote this object the Council decided to offer ten scholarships of 20*l.* each to youths who could pass an examination in agricultural subjects, and who should then proceed to a farmer or land agent, or continue at school for another year. During the sixteen years in which this scheme has been in operation, twenty-two schools have sent up candidates, and fifteen of these schools have furnished successful pupils. The area over which the schools have extended has been large, and the popularity of the examinations has increased.

We have now to consider what is being done by our own Agricultural Department: and after examining the recent Reports from foreign countries, we may endeavour to suggest the lines on which our own Government should take action.

In consequence of the recommendations made by a recent

Departmental Committee, a sum of 5,000*l.* was placed at the disposal of the Agricultural Department of the Privy Council during last year; and the same sum has been continued to the new Board of Agriculture for the purpose of assisting agricultural education and research.

The Government aid, so far as yet distributed, has been mainly devoted in Scotland to subsidies in aid of classes for training of rural schoolmasters, and in England to fixed or moveable dairy schools and lectures, while grants have been given also in aid of such experiments as those carried out by the Bath and West of England Society or the Norfolk Chamber of Agriculture.

The Committee suggested the establishment of a central normal school of agriculture, and of other subsidiary schools, under the direction and at the expense of the State. Wisely, as it seems to me, the Department has abstained from attempting to establish State schools, and has hitherto confined its operations to assisting local efforts. I am not so dissatisfied with the position of British agriculture, nor so fearful of the competition of the foreigner, in so far as it arises from his superior knowledge of rural affairs, as to be desirous of seeing our new Department of Agriculture undertake the business of establishing agricultural colleges and schools, and taking out of the hands of voluntary associations the education of agriculturists and the improvement of agricultural knowledge.

If there be a real demand for such teaching, I think we have resources of our own from which we may obtain it. Cirencester, Downton, and Hollesley Bay, are instances of what may be done for higher teaching by private effort. Aspatria, under great difficulties, has provided successfully for a younger and less wealthy class of students.

At the present moment two schemes are before the Endowed Schools Commissioners for the purpose of establishing schools for the teaching of the principles of agriculture. One of these schemes, which is being promoted by the Mercers' Company, will provide for an agricultural school to be placed at West Lavington, in the county of Wilts, and for the education of forty foundation boys paying for board and education 30*l.* a year. It is also proposed to receive ordinary boarders at a higher rate. At this school instruction will be given in—

(a) Geography and History; English Composition; Mathematics, including Mechanics, theoretical and applied; French or German.

(b) Chemistry, Agricultural Chemistry, Geology, Botany, Animal Physiology, Entomology; Veterinary Medicine and Surgery
Mensuration, Land-surveying, Book-keeping.

Practical instruction will be given in the following subjects :—

- (c) Farm Work, Stock-keeping, Carpentry, Smith's Work (including Horse-shoeing), Surveying and Levelling, Forestry, Fruit-culture, Bee-keeping, and Veterinary Surgery.

At Woodbridge, in Suffolk, the scheme for another school is under consideration, to which a scientific side will be attached, and in which the subjects of education will be : Chemistry, especially Agricultural Chemistry ; Mineralogy ; Botany ; Applied Mechanics ; Animal Physiology ; and, at an extra fee of 4*l.* a year, Practical Agriculture.

The fees in this school will be higher, but here also there will be scholarships and exhibitions.

I would here, however, refer the reader for more detailed information on the position of agricultural education on the Continent and in England to the papers on that subject published in the *Journal* in 1885, and written by Mr. Herbert Little, whose untimely death has deprived the Council of the Royal Agricultural Society, and the agricultural interest of England, of one of their brightest and most intellectual members.

Up to the present time the Royal Agricultural Society has done nothing towards providing or encouraging the teaching of agriculture by travelling lecturers. The Bath and West of England Society has made an admirable start in this direction by the institution of its travelling dairy school ; and it would not seem unreasonable that our own Society should encourage and assist efforts made in this direction by local and district associations.

France.

I have not space here to do more than glance at the admirable and exhaustive Report on French Agricultural Schools which was prepared for the Agricultural Department of the Privy Council by Major Craigie in 1888, and which contains a mass of detail most interesting to the agriculturist. Since Mr. Jenkins wrote on this subject in 1882 great alterations have taken place, and the questions under consideration seem to have been systematised and thought out very completely. To quote Major Craigie, agricultural education is provided in France—

I. In Elementary Schools.

- (a) In ordinary *Écoles Primaires*.
- (b) In the higher *Écoles Primaires Supérieures*.
- (c) In the Normal Schools which provide teachers for (a) and (b).

II. By Local Lectures.

- (a) By Itinerant Professors.
- (b) By Fixed Chairs or Courses of Agricultural Instruction.

III. By Local Research and Demonstration Stations.

- (a) By Laboratories furnishing cheap analyses.
- (b) By Experimental Plots for agricultural research.
- (c) By Experimental Fields arranged for demonstration.

IV. In special Local Schools.

- (a) In *Fermes Écoles*, or Farm Apprentice Schools.
- (b) In *Écoles Pratiques d'Agriculture*, or Practical Schools.
- (c) In certain *Écoles professionnelles*.

V. In State-maintained Agricultural Colleges.

- (a) In the three National Schools of Agriculture.
- (b) In the three National Schools of Veterinary Science.
- (c) In the National School of Forestry.
- (d) In the National School of Horticulture.
- (e) In the National Shepherds' School.

VI. In a Central Agricultural University.

- (a) In the *Institut National Agronomique* at Paris.

Under the first of these heads any expenditure by the State is defrayed from the general Budget of Public Instruction. In the second, third, and fourth divisions, the State provides for salaries of officers, or a subvention to meet local provision; while in the fifth and sixth divisions the charge falls directly on the State.

In the Budget of 1888-9 the sum of 106,224*l.* was taken for the provision and management of State institutions, and 57,876*l.* for payments and subventions to local officers and institutions.

I am very much tempted to quote freely as to the work in the primary schools, which, as pointed out in Major Craigie's Report, has encountered many difficulties and is still but unequally and imperfectly developed in practice; I feel, however, that it is more desirable to note some remarks on the work of the departmental professors. Major Craigie says that the French farmer desires to be taught by the sight of actual results rather than by the most eloquent verbal recommendations. In consequence, the Government is encouraging the establishment of experimental plots, not so much as stations for scientific research, as fields of illustration of the good results of improved processes, seeds, manures, &c. In connection with these fields of demonstration, the number of departmental professors has increased from nine in 1875 to 55 in 1878, and 87 in 1888. In addition to their duties at the normal schools, and their supervision of the agricultural work in the primary schools, they are expected to give at least twenty-six local lectures or conferences in each year. Much is done by individual landowners and local societies in the way of establishing and sustaining these experimental fields.

Major Craigie commences this excellent Report by saying

that "the general and prolonged depression of agriculture has had the effect of directing attention among all the nations of Western Europe to the advantage of more extensive provision for the scientific and practical instruction of farmers," and he intimates that there is amongst the cultivators themselves a much increased appreciation of the work.

Belgium.

Mr. Gosselin has furnished a very interesting Report for Belgium, where the Ministry of Agriculture, which includes Industry and Public Works, appears to be the initiatory power in almost all matters of agricultural interest. The central office costs about 17,000*l.* per annum, and there is a further expenditure of 65,500*l.* in the last Budget, of which about 30,800*l.* is devoted to agricultural education, including the cost of experimental fields and agricultural lecturers. In addition to this expenditure, the Provincial Budgets furnished a sum of 20,300*l.*

From this expenditure of 30,800*l.* on agricultural education, what does the State provide?

(1) There is the Government Agricultural Institution at Gembloux, in the province of Namur, with a farm of 148 acres, gardens, and experimental fields for teaching agriculture, horticulture, and arboriculture. This institution has the advantage of being in close proximity to large breweries and sugar manufactories, in which the students can have practical instruction. The course of instruction lasts for three years, and the students, who are not admitted under sixteen years of age, must pass an entrance examination on general and botanical subjects. Boarders, if natives of Belgium, pay 28*l.*, foreigners 40*l.* per annum; day scholars—Belgians 12*l.*, foreigners 16*l.* per annum. Successful students can obtain the diploma of agricultural engineer, which qualifies them for other official teaching positions.

Attached to Gembloux is an agronomic laboratory for experimental research and analysis. Similar institutions exist at Ghent, Liège, Hasselt, Antwerp, Mons, and Louvain; at each of which the Minister of Agriculture fixes the fees to be paid for the analytical and physiological examinations.

(2) School of Horticulture and Forestry at Vilvorde and Gand.

(3) Botanical Garden at Brussels.

(4) Veterinary College at Cureghem-lez-Brussels. At this college the course is for four years. The regular pupils pay 12*l.* for the teaching of each scholastic year; the free pupils 2*l.* for each course of lectures. There are at present boarders, but it is intended to do away with the boarding system, and to increase the number of pupils and reduce the fees.

In addition to these central schools, the Government are endeavouring to encourage the teaching of agriculture in primary schools. The first attempt in this direction was made by organising agricultural classes in connection with middle-class schools; but as most of these schools are placed in towns, it was found that there was not much personal interest taken in agricultural matters, and the classes were a failure. The Minister of Agriculture has now directed that agriculture is to form part of the curriculum of the normal schools, in order that the masters of the country primary schools may teach the subject to the village children. "Boys over thirteen years of age in the country districts have no more time to devote to schooling; they are wanted on the farms, and the only way to reach them is through the primary schools." Grants in aid are given according to the proficiency of the pupils.

"Agricultural education," says Mr. Gosselin, "is still in an experimental stage, but there can be little doubt that agricultural classes attached to the primary schools for the young, and experimental fields and lectures for adults, are the best means of imparting information on a matter of vital interest to the agricultural population."

As far as education in the primary schools goes, it would seem that the Belgian Minister of Agriculture is feeling his way very much in the same manner as our educational authorities at home. There is the same pressure for boys' labour, and the school limit of thirteen appears similar in both countries. I confess, for my own part, to having very great doubt as to the possibility of giving anything like useful technical education to boys under thirteen. Up to that period their intellects need general training and cultivation, in order to enable them to avail themselves of technical instruction hereafter.

In addition to the means of education offered in the above-mentioned colleges and in the primary schools, the Agricultural Department of Belgium provides for lectures on agriculture and other kindred subjects. There are "Agronomes d'État," State Agricultural Professors, and "Agronomes Adjoints," with salaries varying from 200*l.* to 120*l.* per annum. These form "as it were, a body of nomadic agricultural teachers," whose duty is to "popularise, in a practical manner, agricultural science. To this end they personally visit the farmers, and give gratuitous advice to any asking for it; they organise each in his own district a series of free lectures, so that in at least five districts in each province a complete course of instruction should be given in one or other branch of the science applicable to the neighbourhood." At present there are thirteen of these "Agronomes."

"When first started, the lecturers had often to be contented with an audience of ten persons; now the attendance is generally over one hundred." In connection with the lectures are the experimental fields, "which were at the outset doubtfully received, but have now become very popular; offers of ground for these experiments are made from all parts of the kingdom." Practical demonstrations are made by the "professors," soils are analysed, new manures, or varying quantities of manures, tried, instruction in poultry-rearing, dairy management, cultivation of pastures &c., are given.

"The landowner lends the ground and supplies the needful labour and natural manure; the Government pay for the seeds or plants; and the product of the crop, good, bad, or indifferent, as the case may be, is handed over to the landowner." In 1885-1886, there were 408 experimental fields at the expense of the State, and 86 at the expense of private individuals; while for the current year (1889) there are only 287 State fields, and 347 worked by private individuals. It is proposed still further to limit the State experimental fields, and gradually to confine them to land cultivated by agricultural or horticultural societies.

There are other duties, connected with disease in animals, forests, fisheries, &c., which are undertaken by the State, and are commented on by Mr. Gosselin; but I have confined my extracts to matters connected with agricultural education. Although Mr. Gosselin has given very able information in his Report, there must be several matters of detail only to be obtained by personal investigation. I think that if aid is to be given by a department of the State in our own country, or by the Royal Agricultural Society, the action taken by the Belgian Government offers an example which might, to some extent, be followed; but that the initiatory steps might be taken by local bodies, and that the work, if satisfactorily commenced, should receive guidance and assistance either from this Society or the State, or from both combined. Establishments like the Normal College at Gembloux, or the veterinary and horticultural colleges, might, under proper restrictions, receive assistance from the State, in order that lecturers and teachers should receive a thoroughly satisfactory and practical education, something very different from the mere working up of technical handbooks.

Netherlands.

Mr. Conyngham Greene, writing of what is being done in the Netherlands, states that there is no separate Ministerial Department for Agriculture, but that the Government takes an

active part in the promotion of the interests of the agricultural community in the kingdom. In the year 1886 "a Government Commission was instituted to inquire into the condition of Agriculture, and to suggest the best means for improving it by assistance from the State." The labours of this Commission have not yet been concluded, but interim Reports have been presented. With respect to agricultural education, the Commission advise the establishment of agricultural colleges, and that the universities should be invited to co-operate by the institution of professorial chairs of agriculture, which should be endowed from Government funds. Further, they suggest raising the salaries of such teachers as have obtained a certificate of proficiency.

They also consider that the institution of special professional schools (*Volk-Schulen*) is essential to the development of the agricultural prosperity of the country. "These schools, in the opinion of the Commission, should be small establishments, suited to local requirements, and easily accessible to the agricultural community of the State." Winter schools (*Winter-Schulen*) for theoretical instruction should also be encouraged, and while the instruction of the schools is under the direction of the State, the subsidy should amount to 50 per cent. of the expenses of institution and management, provided that the prescribed conditions of efficiency are fulfilled.

The Commission also recommend the acquisition of land for practical demonstration, and advise the appointment of special Government officials to be called Agricultural Instructors. In connection with these a further recommendation is made as to the establishment of three Government institutions for the purpose of testing the genuineness of manures, feeding-stuffs, seeds, and the chemical properties and value of "the soil, and natural attributes of the farm." The estimated cost of the three establishments would be 2,000*l.*, the annual expenditure 80*l.*, and the staff of each would consist of a Director receiving 160*l.* to 180*l.*, an Assistant 80*l.* to 120*l.*, and a Clerk 40*l.* per annum.

The necessary funds for the establishment of these stations have been voted, and they will be established and opened without further delay.

The Legislature has also voted grants towards the expenses of a School of Forestry, and to a Dairy School at Oudshorn, and to found a course of instruction on the same subject in the Provinces of Gueldres and Overijssel. The Veterinary College at Utrecht, which had an attendance of ninety-nine students in 1886-1887, who each go through a course of four years' instruction, is supported by the State. The total expense was

for 1886, 7,446*l.*, towards which 1,807*l.* was received from fees, sale of farm produce, &c.

Denmark.

The State has taken an active part in the promotion of agriculture in Denmark, as "the total sum provided in the Budget of the Agriculture Section for 1889-1890 is 56,680*l.*, which exceeds by nearly 100 per cent. the expenditure sanctioned in 1883-1884." The remarkable strides in advance which Danish agriculture has recently made seem to justify this expenditure; but the last Reports to the Foreign Office do not contain any special remarks as to any new development of agricultural education in that country, which has already received exhaustive notice in our Journal at the hands of its late editor.¹

Germany.

Mr. Lowther gives a very interesting analysis of the expenditure of the Ministry of Agriculture in Germany. In the last Budget for 1889-90 the total amount voted is 571,257*l.*, of which 51,914*l.* is devoted to Educational and Scientific purposes, and 40,400*l.* to the Veterinary Department.

The State appears to maintain the High School at Berlin, the Agriculture Academy at Poppelsdorf, the Pomological Institutes at Proskau and Geisenheim, and an establishment at Wiesbaden for chemical experiments in connection with agriculture. The salaries paid at these establishments amount to 8,447*l.* per annum. In addition to these seats of instruction, there are sixteen efficient agricultural schools distributed amongst the different provinces, the Provincial Administrations directing the course of study, and paying 13,100*l.* towards their cost, while the annual subsidy from the Government amounts to 6,648*l.*

There are also State subventions towards the maintenance of laboratories where experiments and investigations of great importance to agricultural interests are carried on. In 1888 the total cost of sixteen of these establishments was 14,846*l.* and the Government subsidy was 5,372*l.* The position and importance of these laboratories appear to be steadily increasing; the independent revenue grows, and the Government subvention decreases. Here, as in Belgium, I feel that there are many matters of detail and of much interest to our readers which are not recorded in the Foreign Office Reports, and of which, unfortunately, I have no special knowledge.

¹ *Report on the Agriculture of Denmark*, Vol. XII., 2nd Series, p. 378. See also Mr. Little's "Summary" of Mr. Jenkins's *Report to the Royal Commission on Technical Instruction*, Vol. XXI., 2nd Series, p. 158.

I have only attempted to review the Reports of those European countries which are in immediate contact, as it were, with our own, and where agriculture is carried on to some extent under similar conditions, where the soil has been worked for ages, and in which no special advantages of climate or natural fertility accrue to the cultivator. In the Reports on all these countries allusion is made to the same pressure that we ourselves experience from severe competition. These agriculturists as well as ourselves feel what advantages the virgin soils of the West and the newly-developed wheat-lands of the East possess. Laborious and skilful as the farmers of some of these countries have always been, they know that if they are to hold their own in the markets of the world, they must endeavour not only to produce a greater amount of grain and meat from the land which they cultivate, but that they must do this by improved processes, and cheaper methods of production. For these reasons they welcome the teaching of science; and when the agriculturists see the marvellous progress which has been made in other industries by the use of brains as well as hands, they also ask that some portion of the endowments of old time, or aid from the general revenues of the State, may be furnished to further develop the teaching of modern discoveries in the most ancient art of the world. I gather from these Reports that British agriculturists must not look to State aid or State teaching as the only, or even as the primary, force in agricultural education. They may, however, expect that in agriculture, as in other branches of knowledge, the State may exercise some superintendence and authority as to the methods of teaching, and may supply some assistance towards the attainment of a more scientific knowledge of the art which they practise.

JOHN DENT DENT.

THE EARLY FATTENING OF CATTLE AND SHEEP.

THE sheep and cattle of three hundred years ago were diminutive compared with our present breeds, and the sheep were, as Mr. Youatt remarks, "strangely" so, since they were not bred for the carcass as well as the fleece, but almost exclusively for the latter. The English people of Henry VIII.'s time were strangers to beef and mutton. In 1531 the latter was so little appreciated, that its price was only three farthings per pound. Beef was twice as dear, but its use was confined to the summer

months, except when salted, and the population generally ate scarcely any mutton or beef. The million in those days lived largely on "spoon meat," which now our working classes despise. The bulk of the population was not then assembled in towns, as now; it was spread over the country, and the only meat commonly used was that of the only animal suited to very small farms—the pig, the fattest of all domestic animals; as fat when finished off, at thirty stone, as any bullock of four years old whose skin-full of tallow was ever rewarded by a prize.

I have mentioned the fat pork of our predecessors, because a clever writer, making fun of "baby meat," has described it as "a soft, juicy mixture of fat and lean, by the eating of which we hope to produce large and strong muscles in our own bodies and limbs. Hope does, indeed, 'tell a flattering tale.'" The accomplished writer could have little thought that within three or four years of his pronouncing against early fattening, as it is now practised, the system would have extended itself throughout the length and breadth of the land. If he had taken the other side, he might just as well have shown that the juicy mixture is at least digestible, that it contains a great deal more lean than the meat consumed at any former period of history, and that, moreover, it is Hobson's choice with the public—they must take what they can get. Meat is not so plentiful in these days that we can afford to wait for the complete maturity of the live-stock which produce it. It is not necessary, however, to point out the futility of opposing a national predilection, and I shall proceed at once to offer a slight historical sketch of the gradual improvement of cattle which rendered "baby beef" possible.

The modifications in the domestic breeds of animals, effected partly under the influence of locality, partly by intention on the part of breeders, may be recognised in their results by the existence of widely different families of cattle and sheep. "The possibility of selection rests on variability," says Mr. Darwin, and we see in all directions that the domestic animals have varied profoundly from their original types. There is scarcely any limit to the extent of variation when persistent attempts have been made to influence it in one particular direction. At any of our great shows of fancy pigeons or of dogs, to say nothing of the ordinary live-stock of the farm, the marvels—one might say the excesses and absurdities—of variation may be recognised. The cattle of the Channel Islands offer a familiar example of what may be accomplished in selection for the dairy under favourable conditions. Colonel Le Conteur has well remarked in this *Journal* (Vol. V., 1st Series, p. 48) that the cattle of the small island of Jersey could not have been improved in

their milking qualities with such great rapidity in a more widely extended country.

Most persons are familiar with the great improvements, originated in the last century and continued in the present, which gave us our existing breeds. Reference should also be made to the displacement of old, and sometimes of improved, breeds by others superior to them, which has occasionally happened. Mr. Youatt mentions that the Longhorn cattle in their native home, improved as they had been by Bakewell, were "suddenly swept away as if by some murderous pestilence," by the rivalry of Shorthorns. The same catastrophe has happened to the older breeds of pigs since the introduction of foreign varieties which ripen earlier than the old sorts.

It may be safely asserted that our modern breeds of cattle have, to a great extent, won their position by their early maturity as compared with the older breeds. Certain breeds are no doubt adapted to particular districts, like the Herefords, which are *par excellence* a pastoral breed of cattle. Herefords claim as long a pedigree among improved cattle as Shorthorns. The *Hereford Herd-book* was not produced till 1845, but the breed had been most carefully selected and cultivated for more than a hundred years. Notwithstanding their extensive use in America, they are a more local breed than the Shorthorn. Still they equal them in early maturity, and although they are generally of smaller size, they reach as great a weight at as early an age when the system of high feeding from birth is applied to them.

The same early maturity is found in the Devons, whether they be of the lesser type of beautiful red cattle which originated among the hills of North Devon, or the heavier breed found on better land in Somerset and parts of South Devon. Their *Herd-book* dates from 1851; but the record of their improved breeding runs back more than a century, and early maturity has been a special aim of their breeders during the whole of that period. Every breed has its special aptitudes. Two years since I made a tour among the Devons, visiting the late Lord Falmouth's famous herd at Tregothnan, Cornwall, Mr. Skinner's at Bishop's Lydeard, and Mr. Bickle's Bradstone Hall herd of 160 head near Tavistock. The breed is a hardy one, and there is no cosseting and caudling of cattle in the common practice of Devonshire. The young breeding animals are often wintered out of doors in small, sheltered pastures provided with open sheds to which they can retire at will. The Devons are specially adapted for pastures of less luxuriant character than some other breeds require. They will thrive on land of moderate quality where some of the heavier breeds would hardly gain flesh with-

out a great deal of artificial aid. But the Devons, with all their merits, would not have won for their owners such a superfluity of silver plate, if they did not share with the other beef-making breeds the merit of making the best possible use of their food. They are, in fact, fast flesh-forming animals whose meat is of the finest quality.

I have no desire to magnify the merits of any particular breed, but I think we may recognise the enterprising search for good and quick beef-makers in the advance of Sussex cattle in the favour of the public. I remember them a heavy and a hardy breed, well suited for the rough pasturage of Sussex, and for wintering well in straw-yards on rather short commons, their food chiefly arising from the daily thumping of the flail. Few turnips were grown in those days, and the cattle had to "rough it" in straw-yards in winter, and in clover, grass, and stubble fields during the rest of the year. They were a big breed, however, and Mr. Youatt was able to describe them, sixty years ago, as having deep, round barrels, straight backs, big bellies, great capacity of the parts containing the heart, lungs, and digestive organs, and wide loins with "spread-out" hip-bones. They were well ribbed up, too; but they had not the beauty and symmetry of the Devons, and although they made a great weight of beef at three or four years old, or later after their period of service as working oxen was over, the principle of early maturity had not been specially developed in their case as it has been since. At the present time, I believe, no one will dispute that few breeds have recently attracted more attention than the Sussex, and that their special merit is acknowledged to be the production of a large amount of beef of good quality, on a moderate amount of food, at an early age. Competition is too keen to admit of any breed getting far ahead of others; but although the Sussex cattle may be equalled as economic meat-makers they are certainly unsurpassed. The carcass test is not yet applied at the Shows of the Smithfield Club, as it has been for many years at Chicago, Kansas, and elsewhere; but among the butchers' reports of prize beasts sold at the Show of 1888, a Sussex beast came out best in the proportion of dressed carcass to live weight. The Sussex cattle are still blemished by a certain coarseness and want of symmetry, but their breeders are getting rid of these faults, and they are doing so, one may hope, and obtaining fine bone and mellow skin, and the sweet countenance and beauty of form of the dainty Devons, without sacrificing the large frames and the hardy and robust constitution of the Sussex breed. The first volume of the *Sussex Herd-book* is dated 1879; but breeders now grown old have told me

that their grandfathers, far back in the last century, owned excellent herds of the red cattle of the country which they had greatly improved. Arthur Young was fond of telling the same story, and his *Annals* contain interesting accounts of the herds of his friends in Sussex, and of their working oxen and the mountains of beef they made at six or seven years old.

It would seem ungracious not to mention the Polled Angus, the breed of William McCombie, with which he won at the Paris International Exhibition of 1878 the premier prize for "cattle of any breed for beef-production," and specimens of which he often sold to the butchers at 55*l.* each. It is true that great weights do not alone support the argument as to the rapid move of breeders in the direction of early maturity in recent times. But a *grand prix* of 2,500*fr.* was offered at the same Exhibition for animals for breeding purposes, and a *prix d'aptitude* of 2,500*fr.* for animals for beef-producing purposes, and both were carried off by a group of two-year-old Polled Angus cattle, which were described as being "as even, plump, and ripe as a cherry."

I shall name last, in connection with the transference and increase of early maturity, the illustrious Shorthorns. The first volume of their *Herd-book* appeared in 1822; their fame as a grand breed of Teeswater cattle was known to travellers as far back as the year 1700, about a hundred years before Robert and Charles Colling, the miscalled founders of the breed, commenced their sales of high-priced stock. This is the most widespread of all the breeds, the best adapted for purely artificial systems of farming, the least fastidious in regard to climate, soil, or lodging. We expect much of our fattening cattle; we crowd them into small yards—as I saw the other day at a covered homestead, where the animals had little more than standing-room—so that the largest possible number may yield their beef and manure under the least spread of roof. We even tie them by the neck, so that the frightened physiologist exclaims, "You allow your young bullocks no exercise—they cannot possibly develop muscle so;" and yet, somehow, the muscle comes. I suppose it is by hereditary tendency. "You allow your young fattening animals," says the physiologist, "no opportunity of acquiring respiratory capacity. Summer and winter you allow them no exercise, and only one result can follow—you will ruin your breeds." Probably this would have happened long ago, but for the wonderful adaptability of the Shorthorns, and for the fact that the early fattening of steers cannot affect breeding stock which does not share the treatment.

The Shorthorn breed needs no praise. It equals, if it does

not surpass, any other breed in the economy of meat-production at an early age. Steers and heifers alike are constantly fattened up to 100 to 120 stone of 8 lb. at two years old. There is no breed that assimilates so readily with others, and that is, therefore, so useful in crossing for the improvement of inferior stock. And the crosses by a Shorthorn bull, especially out of the large varieties of polled cattle, have had greater weights recorded of them than the offspring of pure-bred stock.

In the earliest examples of early fattening in Sussex which came under my observation, the yards and barns and sheds of my friends were kept well filled with relays of stock, sold at eighteen months, or less, and purchased as calves. Most of the breeds were represented, including Sussex from around home, Herefords from the western dairy districts, and Shorthorns from the Brighton dairies and elsewhere. No decided preference was felt for either of the breeds; but the Shorthorns greatly outnumbered the others, and I suppose this would be the case throughout England, except in special districts.

At the same time that Bakewell was improving the breed of Longhorn cattle, he was also engaged in founding the Dishley breed of Leicester sheep; and most readers of this kind of history will remember that one of the visitors to Dishley was John Ellman, who had already commenced the development of the poor little Southdowns—with their small carcass, flat ribs, and light fleece, and nothing to admire but a good leg of mutton—into the most famous of the short-woolled sheep. The improvement of sheep proceeded continuously, and was, of course, conducted on the same lines as in the case of cattle. The breeds of sheep must have been very numerous, since most of the great heaths and commons, or other characteristic tracts, fertile or barren, possessed distinct breeds. Mr. Youatt says quaintly, in his work on sheep: "The disgraceful breed of the Kentmore sheep, and all their crosses, are now supplanted by a better animal in the county of Cumberland;" and in the next sentence he mentions that the original long-woolled sheep of the lower grounds of Westmoreland had been replaced by Leicesters and Cheviots and their crosses. The Teeswater sheep—a tall, clumsy, polled animal, proceeding from the same stock as the old Lincolnshires—had been crossed with Dishley-Leicesters; and the breeders of the same sheep, now known by the name of Wensleydale, are at present establishing a flock-book.

Our subject possesses a history which may perhaps assist breeders in shaping the future. There is no doubt that the absorption into the modern races of at least a dozen breeds of sheep, north and south, and sometimes the complete extinction

of the more "disgraceful" types, was due to the earlier maturity of the new comers. Mr. Youatt says of the Teeswaters that the first effect of the cross with the Dishley sheep—a somewhat kindred breed, as he points out—was a very considerable diminution in size. But if the carcass was smaller, it was rounder and more compact, and the animal came to maturity earlier; so that considerably more sheep were kept, and more mutton was produced, on the same quantity of land than before. The wool of the Teeswaters was not so much improved by the cross as the carcass, because "like produces like," and the Dishley sheep had been bred principally, or almost exclusively, with a view to quick fattening and early maturity. These, says Youatt, were the characteristic points of the sheep, "and were sure to be transmitted to the offspring."

Without describing the methods of the great breeders, from Ellman and Bakewell downwards, it has seemed desirable to direct attention for a moment to the golden age of discovery in the breeding of live-stock, for the purpose of showing that early maturity has been kept constantly in view by the great breeders for the past two hundred years at least. That there has been continuous progress up to the present time is shown conclusively by a comparison of weights and ages, such as Youatt's synopsis in the *Complete Grazier* (1846) enables us to make. The following figures apply to a period between sixty and seventy years ago: The average weight of Southdown wethers at two years old was 18 lb. per quarter, or 9 st. the carcass; of improved Cheviots, at three and a half years old, 19 lb.; of Cheviots, at four and a half years, 16 lb.; of Romney Marsh sheep, at two and a half years, 24 lb.; of Dishley-Leicesters, at two years, 22 lb.; of Lincolns, at three years, 25 lb. per quarter. Previous to Ellman's improvements wethers of the older Southdown breed were rarely killed till three years old. After the improvements, and about fifty years ago, they were usually fattened at two years old, and in the case of superior flocks at fifteen months old. They are now sent to the butcher at a year old, or less.

Plants and animals have been "improved" by man till they have assumed something of the character of monstrosities. To mention only a few of the modifications occasioned by selection with a view to utility, it has given sheep their heavy fleeces, and all the meat-making animals their power of forming flesh rapidly; it has given a dairy of twenty-five Shorthorn cows an average of 885 gallons of milk each during their ten or eleven months of yield, and 1,200 gallons apiece for ten selected cows; it has conferred on horses size, strength, endurance, speed; and it has endowed our domestic fowls, since the first

hen came to Europe 600 years B.C., with the gift of "ever-lasting" egg-laying, and with an extraordinary diversity in the colour of the plumage and in the size and character of the different breeds.

It must be confessed that our cultivated breeds of animals and plants have been rendered unfit to cope with such competitors as they would meet with outside the boundaries of fields and farms. Few, if any, would survive when deprived of the protection of the hands that moulded them into the forms that most of them have assumed. Neither the horse nor our neat cattle are found in a wild state. Our sheep, with their "improved" fleeces, would be destroyed, without careful shepherding, by the attacks of parasites and flies. Our poor pigs have neither snout nor leg enough to hold their own in a wild state.

It is certainly a considerable interference with Nature to hasten the maturity of animals and to induce their breeding at an earlier period, and yet this has been done for our advantage with most or all of our domestic animals without diminishing their constitutional power or lessening their average duration of life. It seems, then, illogical to imagine that the utmost limits of early maturity have been already reached. Professor G. T. Brown commenced an article on "Dentition as Indicative of the Age of the Animals of the Farm" (Journal, Vol. XVIII., 2nd Series, 1882) with these words: "Early maturity is a *sine quâ non* of breeders and exhibitors of farm stock; and it is one of the objects of Agricultural Societies to encourage them in their efforts to produce breeds which reach a state of perfect development at a comparatively youthful period." As something more remained to be done in 1882 in the attainment of earlier development, it cannot reasonably be urged that we have reached finality yet, since only a very little can possibly have been accomplished in so large a field within a period so short as eight years.

As "the teeth"—quoting Professor J. B. Simonds ("On the Teeth of the Ox, Sheep, and Pigs, as Indicative of the Age of the Animal," Journal, Vol. XV., 1st Series, 1854)—"belong to the system of organs termed the digestive," it seems almost certain that the improved feeding as well as the superior breeding of domestic animals during the past 200 years must have hastened the development of their teeth.

On this point Professor Simonds says that at *three years and a quarter*, "in animals of early maturity, the fourth pair of incisors will occupy the places of the temporary, and will thus complete the dentition of the ox." By far the larger number of oxen, Professor Simonds says, "will not put them up till

after three years and a quarter; and I have repeatedly examined animals whose ages ranged from three and three-quarters to four years, and found these teeth in the act of cutting. On the other hand, I have occasionally seen them, in Shorthorn bulls, fairly through the gum at three years and a month." He says that Shorthorns and Herefords had furnished him with the greatest number of cases of early dentition, and in his Tables of early and late dentition the Professor notes that the period of cutting the incisors is among other causes dependent on breed. One would not expect to meet with early dentition among the wild cattle of Chillingham or Chartley Parks.

As might be expected, sheep obey the same law as cattle, and Cotswolds, which took the first place at Islington last December in the contest between young fat sheep, were observed by Professor Simonds to be earlier in dentition than Southdowns, Shropshires, or Hampshire Downs; Leicesters following closely after them.

Professor Brown's experience resembles that of his predecessor, for, although he does not appear to have noticed any further advance since 1850, he found, from numerous observations in that year, that the teeth of cattle, sheep, and swine were developed at much earlier periods than those which were stated in the works of Youatt. If, therefore, the accounts of the older veterinary writers on dentition are correct, we may certainly infer, from the evidence of the modern experts I have just quoted, that improved systems of breeding and feeding have induced an earlier development of the teeth in cattle, sheep, and swine.

Physiologists inform us that the completion of permanent dentition is a fair test of maturity; and as that period appears to have been hastened, it may perhaps be possible to induce cattle and sheep to produce their young at an earlier period than heretofore. This has, in fact, been done by those who use lambs for breeding purposes, and by those numerous breeders of cattle who arrange for the first calf when the heifer is two and a half years old, or about six months before the completion of permanent dentition.

Few persons are engaged at present in systematic experiments with a view to earlier development than has heretofore obtained among animals that are bred for food. In offering some evidence on this subject, I propose to quote the opinion and practices of the late Mr. John Coleman, who was a consistent advocate of early maturity both in breeding and feeding, believing that heifers might produce their first calf at little over two years old, and sheep when one year old, without injury to

growth or constitution. In the following passage he states his conditions, and describes his management :

"The necessary conditions are: First and foremost, a tendency to early maturity, rendered hereditary by cultivation. Secondly, abundance of good natural food: our land must be in high condition, the pastures composed of nutritious grasses, and the crops we grow of the best possible quality: poor, stunted crops will not bring on young animals; and especially must we have plenty of lime and phosphates in the soil for the development of bone and muscle. Then the climate must be temperate, although this is of less importance than the other factors we have named, because much can be done in the way of shelter. Lastly, the judicious use of artificial food to supplement the natural produce.

"Now let us consider the treatment of calves on a dairy farm; and the management we indicate is such as we have seen carried out with most successful results. The calves are dropped in the spring—probably in March, on the average—and are removed at birth, and not allowed to suck the cow. For a few days their food comprises new milk: after about ten days or a fortnight, warm skim-milk is introduced, with calf meal, boiled linseed, &c., and by degrees the new milk is entirely replaced by old milk, and such easily-digested nutritious materials as experience shows to answer. When the calf is one month old, a little sweetgreen hay is supplied, with rock salt and chalk. As the spring comes on, there are two plans open to us—we may either keep them in well-ventilated covered yards, supplying a mixture of green and dry food, which has some advantages, especially in the selection and preparation of suitable food, and protection from irritation by insects, from which serious loss of condition often occurs; or they may be turned out during the day into a home paddock, being brought in at night. In either case, they should still have any skim-milk we can spare, in which ground linseed cake or linseed meal may be soaked, and a small quantity of pulped mangels, with carefully-prepared chaff (principally made from hay and a little oat straw) and a little oatmeal, may also be used; indeed, the greater mixture of nourishing material, the better. It is not the quantity of food that will be consumed, but the quality, as developing frame and flesh, that is important. After May, calves that are to live out may be run in small paddocks, divided into lots of six or eight, but it is most important that each field should have a shed providing ample shelter for the lot, where they can, to some extent, be protected from insects; and of course a supply of fresh and pure water is essential, care as to change of food, and the supply of hand meat to supplement the grass when the latter fails, such as tares, clover, &c., with a small allowance of linseed cake of the best quality.

"When from six to eight months old, the calves should be setoned in the dew-lap as a preventive to black leg or quarter evil where experience has proved liability. The action of the seton is probably as a counter-irritant, but anyhow the evidence of its utility is overwhelming. As soon as the nights become chilly, say early in October—but exact time differs according to locality—the calves should be housed at night, and be accustomed to eat pulped roots and chaff, through which may be distributed whatever meal is supplied. In the daytime they may run out as long as the weather is open, but, as a rule, towards the middle or end of November they are as well in yards altogether, with room for exercise. Winter feeding must be generous; we want to grow the animal as fast as we can, and an allowance of linseed cake is desirable, with a moderate quantity of roots and chaff. The second summer a good pasture supplies all that is necessary.

"About midsummer—that is, when from fifteen to sixteen months old—these heifers are served, in many cases yearling bulls being allowed to run out

with them. Great care should be exercised as to generous feeding during the next winter, as the system has a considerable strain upon it. The failing grass should be supplemented in good time by a mixture of cotton and linseed cake, say, 3 lb. daily; and this should be continued throughout the winter and up to calving, with a liberal supply of roots and chaff given. In this way there need be no check whatever in growth. . . . We are satisfied that, if we have suitable conditions and judicious management, it is both possible and profitable to develop early maturity as regards breeding cattle; and that, if this were more generally followed, more profitable stock could be kept and expenses be reduced."

As the early fattening of recent times has naturally followed closely in the wake of the earlier maturity which many generations of breeders have been aiming at, it seemed necessary, even in a merely practical article, to state the theory and explain the practice of those who believe that further advances are possible.

Having quoted Mr. Coleman on neat cattle, I will now give the views of Mr. Alfred de Mornay as to sheep. Mr. de Mornay's idea, founded on Darwinian principles, is to train the ewe lambs to early-breeding propensities, and this he does by selecting for his first experiment the most forward and matured animals he can find in his flock, mating them with a lamb which is himself as matured as possible, and out of a flock where early development has been encouraged to the utmost. He then makes a careful selection of the produce, using only the forwardest lambs, until, by degrees, the habit of early breeding becomes established. It is, of course, necessary to supply the young ewes with abundant and proper food, in order that the foetus may be properly supported without too great a strain on the parent, and since Mr. de Mornay obtains four crops of lambs in four years instead of three, the extra cost can be well afforded.

It is only within a comparatively few years that ram lambs have become sufficiently precocious to come into use at the age of eight or nine months; and if the propensity to mature early can be fixed as a permanent characteristic of a flock, there seems no reason why the ewe lambs should not partake of it as well as the ram lambs. It only requires that their frames should have become fully developed by the time the tup is put to them; and if it is possible to breed wether lambs to reach the weight and size of ordinary two-teeth sheep at eight or nine months of age, I do not see why the ewe lambs could not be made to complete their development in the same time. Mr. de Mornay's farm is a suitable one for his purpose, having a good dry soil in a favourable climate.

The practice of early fattening is only suited to animals whose breed and treatment have prepared them for fast feeding. Alternate fattening and starving is always bad management for an

animal of any age; and in the case of young animals intended for early fattening mere sustenance rations, for however short a period, cannot be attended with profit. Mr. McCombie, whose cattle-feeding was conducted with great skill, lays down some golden rules worthy of being quoted *in extenso*. He says:

"If a grazier has a number of fields and many cattle, to carry out the treatment of his cattle properly, shifting and fresh grass once in ten or fourteen days should, if possible, be adopted. The grazier must always consider the quality of his grass land, and buy cattle adapted for it. It would be very bad policy to buy fine cattle for poor or middling lands. You must always keep in view how the cattle have been kept. If they have been improperly kept for your purpose, their size, whether large or small, will not save you from loss. If the cattle are kept on cake, corn, potatoes, or brewers' wash or grain during the previous winter, it will be ruin to the graziers. You must not think that I wish you to buy lean, half-starved beasts. What I wish you to understand is, that you must keep the cattle always full of flesh; and, as a breeder, you must be careful not to lose the calf flesh. If you do so, by starving the animal at any time of his growth, you lose the cream—the covering of flesh so much prized by all our best retail butchers. Where do all the scraggy, bad-fleshed beasts come from that we see daily in our fat markets; and what is the cause of their scragginess? It is because they have been stinted and starved at some period of their growth. If you once lose the calf flesh, you will never regain it. You may get a great deal of tallow internally by high feeding, but you will never again make the animal one that will be prized by the great retail butcher."

It is evident that early fattening reduces time and labour, and lessens risks, because the animal is always ready for the market, or it may be held on awhile for better prices. But it requires skill. I have shown elsewhere that young animals make more carcass, as well as live weight, than older ones. It is possible that animals may assimilate their food better when young; or perhaps they apply more of it in building up the body, and less in repairing the waste of the tissues, than older animals. But, however this may be, they should be of good breed, as coarse and ill-bred animals are always slow to fatten; and they should be so fed that no check will occur to them from the period of their birth till they are slaughtered.

Every experienced feeder must have noticed that lean stores often require a great deal of feeding and careful management before they make what stockmen call "a move," and begin to thrive. Without dwelling on the physiological reason for this, I will pass on to observe that retrogressive feeding is very bad economy. The rule of management should be progression, and therefore the calves intended for early fattening should be either bred on the farm or bought when young.

It usually pays best to breed at home, unless the farm is well situated for collecting calves from the dairy districts, or, in some

parts of the country, from small farmers and cottagers. A north-country farmer said to me once, "I get some thumping calves from my labourers." It is very much to be regretted that in all grass districts labourers and their wives do not understand dairying, so that cows and "thumping calves" might become more common among them. The safest plan is to breed at home, and, in fact, one of the great advantages of early fattening is that the shortened process and the artificial method admit of its adoption in neighbourhoods where breeding was till lately disregarded.

Among many farms that I have visited, where early fattening is practised, besides those noticed in a former article,¹ is that of Mr. Edwin Ellis of Shalford, Guildford. Mr. Ellis begins with a good calf—long, broad over the loins, with a deep chest and full eye. He breeds some, and buys many of dealers who bring them to Guildford from the western dairy districts. They are "pailed" at once with new milk, diluted when the supply is short, in which case a little linseed-cake meal is stirred in. The best linseed cake, not too hard pressed, is alone used. The calves soon learn to chew a piece of sweet meadow hay, and lick up a little oatmeal, and afterwards take some sliced roots, which must on no account be frosted. Calves weaned after June are finished without leaving their stalls or boxes. Those weaned earlier run in the paddocks in summer, except at night, or during rain or hot sunshine, when they are carefully sheltered. Their diet is varied. From May to October they are fed on green food of all descriptions, cut, and brought to the stalls—trifolium, spring cabbage, tares, autumn cabbage, and aftermath clover. Hardly any litter is required in the summer months, when the cattle do very well on the bare floor, with hedge-trimmings or other rubbish to lie on. The dry food given to them consists of cake, oatmeal, barley-meal, and, if roots fail, they eat an additional quantity of chaffed straw and hay, as well as corn, good sweet barley straw being preferred to secondary hay. A little treacle is added to the chaff. Mr. Ellis has sometimes fattened his young bullocks up to 120 stone, and they have not eaten more than $3\frac{1}{2}$ lb. of cake, with meal, daily; while Irish steers that had been let down in condition, have eaten 8 lb. of cake daily. He thinks that ten bullocks of that sort have eaten twice as much food as twenty young bullocks, sixteen months old, that were treated on the early-fattening system.

It is not easy to teach the management of cattle in an article,

¹ "Early Fattening of Cattle," *Journal*, Vol. XIV., Second Series, p. 152.

but here are some golden rules by the very successful breeder and feeder whose system I am endeavouring to describe :

"I have always tried to make every man who looks after my stock, of whatever character, an enthusiast in his work. When that is accomplished, your feeding will be satisfactory, and not till then. No feeding can answer if you have a stupid clown throwing in just as much food to one animal as to another, putting fresh victuals on stale ones, and frightening the animal every time he approaches it. I have had such men, and soon parted with them; but when you have inoculated your man with your own enthusiasm, you have got at the root of all good feeding. Watchfulness of appetite, of likes and dislikes, humouring the dainty, changing the unappreciated food, and withholding food when the animal appears surfeited—these are methods that bring success. The man has got to love and understand his animal, and you then do far better to trust him as to feeding than to lay down a diet scale to be strictly adhered to."

In one year 170 young bullocks, all reared at home, were fattened and sold at ages varying from fourteen to eighteen months. Their average net price, sold under the hammer at Guildford, was 17*l.* 15*s.*, and as the price of beef was 5*s.* 6*d.* per stone, their average weight must have been 65 stone each. The weight of beef made per week, at the average age of sixteen months, and including the weight of the calf, must have been nearly 8 *lb.* dead weight, and after deducting 1*l.* 15*s.*, the cost of the calves, the bullocks must have each brought home 4*s.* 7½*d.* per week. Better results can be shown by persons who have bred their own calves or bought them at lower rates, or sold their bullocks at better prices, as Mr. Ellis has done in some seasons. He says of the system :

"One great advantage appears to be that whether the bullocks are twelve months old or sixteen months, they are always 'beef.' We can therefore suit ourselves as to when they go to market. If trade is bad, we slacken, and sometimes hold over for two months, and then, with markets better, out they go. The greater number go out between May and October; then we generally wait till Christmas, and in January especially find a demand for a small ripe bullock. But as a rule they pay better in the summer months."

On a farm of 300 acres with only 15 acres of permanent pasture in small paddocks, six deep-milking Shorthorn cows are kept, and are put to a pure-bred, heavy-fleshed bull. Each cow rears from two to three calves besides her own, and these are all sent to the butcher before they are eighteen months old, the home-bred bullocks beating the bought-in ones in weight and profit. Between March and May there are usually on the farm more than a score of recently-born calves, and the same number of last year's calves, a year old. The bullocks that would have been two years old have usually been converted into beef by Christmas. The calves are weaned at birth, and fed during four weeks on new milk, taking about six quarts each daily; skim-

milk is then gradually substituted for new, and for the next eight weeks they take about six quarts of it daily, mixed with 2 lb. of oatmeal, or boiled linseed and oatmeal. During June, July, August, and September, they are put on a varied diet of mangel, hay, clover, and artificial grasses, with $1\frac{1}{2}$ lb. to 2 lb. of linseed-cake, and the same of bean-meal. Then up to March, when they are about a year old, they get three-quarters of a bushel of roots, hay, and 4 lb. to 5 lb. of cake and meal daily. Then until they are fat, they get the same food as in the former year, but rather more of it, and rather more cake and meal.

As for the demand for the young beef, one hears everywhere the same story—that old-fashioned feeders who have brought their prime, ripe, three-year-old bullocks to market, have found, to their disgust—especially in summer—that the young bullocks are much more saleable than their own, and fetch higher prices, small joints of beef being preferred to large ones.

Ten years ago the marketing of young bullocks at sixteen to twenty months old was quite exceptional; it is now a common practice, and early fattening has become a widespread system. One of the examples I wish to mention is the fattening of calves running with their mothers for a year. The calves were born in spring, summered with their mothers on rich grass, wintered with them, weaned, and then summered with cake to replace the milk. They received cake for four months only, and were killed at the respective ages of sixteen and seventeen months, weighing 74 stones (8 lb.), and 76 stones each. The carcasses of young bullocks fed in this way on grass and corn, and getting plenty of exercise, have proved excellent beef in every respect, with a good proportion of lean, even when the animals did not exceed fifteen months old. The pastures should be rich and cool, where flies are not troublesome. In the case just named, the grass consisted of a portion of Pevensey Marsh.

In the case of those breeds which are least fitted for the dairy—Herefords, Devons, and Sussex—it is a common and profitable practice to fatten the offspring young, after several months' suckling. Mr. Richard S. Olver, of Trescowe, Cornwall, a noted breeder of Herefords, does this. He maintains a herd of 150 Herefords, and breeds about forty-five calves yearly, keeping the best for bulls, and fattening the remainder, which are finished with cake on grass at two years old. He allows each cow to suckle her own calf, or sometimes two calves, for six or seven months. The heifers produce their first calves in summer at two and a half years old—a very early age from the physiologist's point of view.

It seems unnecessary to multiply examples of early fattening, but I should like to call attention to the fact that several of my informants claim a gain of weight for young bullocks, averaging 8 lb. per week from birth to the age of eighteen months. In some cases, as reported in my former article, the gain appears to have been as great as that of the young bullocks, "not exceeding two years old," exhibited at Islington last December, $9\frac{1}{10}$ lb. per week. It appears that the ordinary feeder, having good-sized and well-bred animals to deal with, may vie with the experts who prepare animals for the Shows. Feeding with maximum results is, in fact, easier and less wasteful in the case of young animals than of old ones.

The early fattening of sheep has become part of the customary system of management in Hampshire. The breeding-farms have ceased to be breeding-farms exclusively. The great fairs at which lambs were disposed of as stores in the summer to purchasers from other counties, have to a great extent gone out of fashion, and the old system has been replaced by the modern plan of fattening the wether lambs at home and sending them to the auction marts or the fairs which are now attended by butchers from London and elsewhere.

A visit to the farm of one of the most successful breeders and feeders in Hampshire, Mr. John Barton, Hackwood Farm, Basingstoke, enables me to describe the method of feeding which has now become characteristic of a Hampshire sheep-farm. The farm of 600 acres rests on the Chalk, the land being light and full of flints. Probably one reason why heavy folding does not taint the soil is its rapid absorption of the dressings. There are 445 breeding ewes on the farm, or 75 ewes per 100 acres, with their progeny. The lambs fall in January and February, and the average crop is about 100 reared lambs per 100 ewes. On September 1, the whole of the sheep, except the rams, were folded on rape in three flocks, including 173 ewe lambs, 130 shorn wether lambs fattening for the butcher, and 445 ewes following the others and clearing up behind them. The wether lambs received 1 lb. each of mixed cake and corn, and many of them were already fit for the butcher; but with 40 acres of rape and turnips in front of the sheep, to be followed by wheat, and therefore to be folded by Christmas, it was necessary to keep on the lambs for the purpose of eating up the food. The lambs were at that date seven months old and many of them would have weighed 10 stone. The whole flock would average probably rather more than 10 stone when finished at less than a year old.

The usual breadths of grain crops on the farm are 130 acres

of mown seeds and sainfoin, 37 acres of fed seeds and sainfoin, 152 acres of roots and rape, including 6 acres of mangel, 35 acres of water-meadow, and 32 acres of down. The total breadth of common sainfoin is 60 to 70 acres, and there is no kind of forage crop which is more esteemed on a Hampshire sheep-farm than sainfoin, which is held to be quite indispensable for its good hay and capital aftermath. The older layers of sainfoin are usually fed through the summer, and the younger and better planted are mown for hay. The aftermath is ready for folding in August, and will furnish "hearty" food till the end of November. In accordance with the Hampshire plan of providing frequent changes for the sheep, they are removed from their night's fold every morning to a fold of rape or turnips. The water-meadows afford the earliest fold in spring, and then follow in succession, through the summer, tares mixed with winter barley, rape, and seeds. It cannot be said that Mr. Barton's big, growing lambs weighing from 7 to 10 stone are stuffed with too much corn. Their early fattening is secured by skill in feeding with abundant forage of several kinds. The annual sale of 80 ram lambs on this farm shows the advance that has been already made in early maturity, and in producing lambs whose sires do not exceed twelve or fourteen months old. What the males do already, the females may accomplish by-and-by.

Early fattening may be said to have now become mainly a question of feeding. I do not, of course, mean to assert that a slow breed can be fed up rapidly, but fairly good specimens of improved cattle can be fattened at eighteen or twenty months without difficulty. In fact, the examples given in the *Journal*, in 1878, in the article on "Early Fattening of Cattle," were not pure-bred animals, but the offspring of good dairy Short-horns and half-bred cattle of various kinds.

Those who have not seen the official statistics relating to the Chicago Show, will be interested to learn that the highest rate of daily gain there, in the case of prize-winning animals, was made by a young Hereford of pure blood. The animal weighed 920 lb., and was 350 days old, having gained 2·62 lb. daily. This may be compared with the weight of a Devon steer exhibited at Islington by Mr. John Walter, and weighing 809 lb. at 388 days old, having gained daily 2·09 lb.—pretty well for a little Devon! A champion prize-winner at Chicago, a Shorthorn 1,372 days old, had gained daily from birth 1·74 lb.

After the Smithfield Club Show of last year some valuable information was obtained for the *Live Stock Journal* by Mr. G. T. Turner, who examined the carcasses of some of the sheep and cattle at the slaughter-houses, and saw them weighed. The

highest percentage of carcass to gross live weight was obtained by Messrs. Uttings' third prize Shorthorn ox not exceeding four years old. It reached 76·52. A careful study of the Tables on the opposite page will prove exceedingly instructive and will enable the reader to compare the average daily gain of live weight in sheep and cattle of various ages.

I have given these Tables as a comparison of ages, not of breeds, and in order to make them more complete, it is necessary to add particulars of breeds not included therein. Mr. A. P. Turner's Hereford steer, 578 days old, weighed 1,315 lb. live weight, and gained daily from birth 2·27 lb.; the Earl of Northbrook's Shorthorn steer, 591 days old, weighed 1,518 lb., and had gained daily 2·57 lb. live weight. The Earl of Winterton's Sussex steer, 517 days old, weighed 1,290 lb., and had gained 2·49 lb. daily. Mr. R. J. Turner's crossbred steer, 615 days old, weighed 1,558 lb., and had gained 2·53 lb. daily. The prize-winners are not always at the top in daily gain. Nor have either sheep or cattle, in all cases, maintained the gain of former years. The Hampshires, for example, won world-wide renown by beating, during several years, the larger long-woolled sheep in daily gain; but that was undoubtedly owing to the clever training of a former exhibitor. Last year the long-woolled lambs shot ahead of the Hampshires, and even beat the crossbreds. Mr. J. B. Green's Leicester lambs, 243 days old, weighed 170 lb., giving a daily gain of ·70 lb.; Mr. H. J. Elwes' Cotswolds, 273 days old, weighed 205 lb., a daily gain of ·77 lb.; Mr. G. T. Melbourn's Lincolns, 257 days old, weighed 171 lb., a daily gain of ·68 lb.; Mr. H. Page's Kentish lambs had gained ·70 lb. daily during their 257 days; Mr. H. Penfold's Southdowns, at 273 days old, had gained ·60 lb.; and Mr. Chappell's Oxfordshire lambs, at 294 days old, had gained ·67 lb. per day.

Mr. G. T. Turner remarks of the champion ox under four years old, that the lean meat could not have increased since last year, and he adds that the lesson taught by the "block test" is that the over-aged and over-fed animals are wasteful as compared with the younger ones, and that three years should be the outside age for steers at our fat-stock shows. When Sir Brandreth Gibbs wrote the history of the Smithfield Club, he remarked that one of the primary objects for which the society was established was to determine what breeds of animals and methods of feeding yielded most food for man from given quantities of cattle food. We are not always logical in our methods. The system of feeding for the fat-stock shows has yielded tallow mostly, and not food for man, the organisers of the shows

CATTLE SLAUGHTERED FROM THE SMITHFIELD CLUB SHOW OF 1889.

No. in Catalogue	Description of Animal	Honours	Age	Live weight	Average daily gain of live weight	Weight of dressed carcass	Percentage of carcass to gross live weight
	<i>Steers not Exceeding Two Years Old</i>		days	lb.	lb.	lb.	
80	W. A. Higgs's Hereford steer . .	—	689	1,291	2 02	834	64-60
153	H. F. Dent's Aberdeen steer . .	c.	709	1,757	2-38	1,170	66-59
216	W. Curry's Crossbred steer . .	—	682	1,203	1-90	784	65-17
	<i>Steers not Exceeding Three Years Old</i>						
7	John Wortley's Devon steer . .	First, bred cup and r. best steer	1,000	1,744	1-74	1,152	66-06
48	{ The Earl of Coventry's Hereford steer }	r. and h.c.	1,079	2,084	1-89	1,120	55-06
77	{ The Queen's Shorthorn steer }	Third	1,065	1,909	1-79	1,292	67-68
118	{ Wm. Stewart Forster's Sussex steer }	First and bred cup	1,019	1,858	1-82	1,360	73-20
120	{ Major M. G. Best's Sussex steer }	r. and h.c.	978	1,864	1-90	1,228	65-88
148	{ J. Hammond's Red Polled steer }	—	1,044	1,919	1-84	1,280	66-70
167	{ A. Egginton's Aberdeen steer }	First	1,078	2,073	1-92	1,444	69-66
	<i>Oxen not Exceeding Four Years Old</i>						
14	{ The Queen's Devon ox }	First and r. for bred cup	1,300	1,901	1-46	1,400	73-53
82	{ The Queen's Shorthorn ox }	First, bred cup and cha.	1,325	2,369	1-70	1,632	68-89
86	{ S. W. and H. Utting's Short-horn ox }	Third	1,326	2,112	1-52	1,616	76-52
126	{ C. T. Lucas's Sussex ox }	First and r. for bred cup	1,260	2,062	1-64	1,356	65-80
165	{ R. J. Mann's Aberdeen ox }	First and r. for bred cup	1,339	2,210	1-65	1,404	68-63

SHEEP SLAUGHTERED FROM THE SMITHFIELD CLUB SHOW OF 1889.

	<i>Wether Lambs under Twelve Months Old</i>						
817	Lord Hothfield's Kent lambs . .	First	261	165	0-63	84	50-91
323	E. R. Berry Torr's Devon lambs . .	Second	284	159	0-53	90	60-00
358	P. Saillard's Southdown lambs . .	c.	261	181	0-50	85	64-69
387	{ Wm. Newton's Hampshire lambs }	First and r. for bred cup	314	206	0-65	120	58-25
388	{ Sir E. Hulse's Hampshire lambs }	Second	277	188	0-61	112	59-57
400	{ Marquis of Bristol's Suffolk lambs }	c.	270	178	0-66	104	58-42
455	Samuel Kidner's Dorset lambs . .	Second	344	196	0-56	120	61-22
466	T. Rush's Crossbred lambs . .	First and bred cup	300	201	0-67	123	63-63
	<i>Wether Sheep above Twelve and under Twenty-four Months Old</i>						
307	Hy. Rigden's Kent wethers . .	r. and h.c.	600	279	0-47	144	55-20
327	{ Prince of Wales's Southdown wethers }	Second	630	209	0-33	140	66-99
333	{ H. A. Brassey's Southdown wethers }	c.	644	198	0-31	129	65-15
339	E. Ellis's Southdown wethers . .	Champion plate	607	218	0-36	149	68-35

having taken no account of the quality of the meat, and having taught nothing as to food rations. Still, we have stumbled upon the very useful information that young animals yield—if properly fed—a much larger proportion of lean meat than old ones, and that before either sheep or cattle have reached the period of their earliest maturity they should cease to be eligible for exhibition as fat animals.

Such additions to knowledge have affected the stock-feeding of the whole country. Except in the case of mountain sheep, and of cattle equally slow, the ripe three-year-old wethers and oxen of the old school are no longer met with at market. Quite recently, the fat-stock clubs have been compelled to re-cast their prize lists, so as to meet the requirements of the times. The Smithfield Club admitted lambs to the competitive classes in 1875, and on several subsequent occasions the champion prize offered for the best pen of three sheep of any class has been won by lambs—in 1884, by Southdown lambs which, at ten months old, had gained 61 lb. a day, or 183 lb. of live weight, yielding probably 60 per cent. of carcass, or 13 stone 5 lb. each. Mr. de Mornay's three Hampshire prize-winning lambs in 1877 weighed, when dead, 17½ stone each; and one of his lambs has scaled, when dead, 18½ stone at ten months old. The same Club established young classes for bullocks in 1880, having previously, in 1870, restricted the champion prize for sheep to one-year-old sheep, *i.e.* under twenty-three months in December.

The old-fashioned notion was that an animal must have completed its growth before it could be profitably fattened. At the present time, all the improved breeds rival one another in regard to the early period at which they may be fattened. But for this claim, the Sussex cattle would not have emerged from their local obscurity in the depths of the Weald, nor would the Hereford have been found abreast with the Shorthorn upon the ranches of the Far West; while even that broad-backed beef-making bullock the Polled Aberdeen has come to the front as a quick feeder.

It was long maintained by some theorists that as the term maturity could have only one meaning—namely, complete development—the shortest period of time in which that result could be attained was the object to be aimed at. “No bovine animal,” it was said, “could attain its full natural growth and development in two years; and the question remains to be demonstrated whether an animal fed generously and judiciously from birth would not pay better to sell in its real maturity at, say, thirty months old, rather than as forced ‘baby beef’ at twenty months old.”

This was a problem which stock-feeders in England have

worked out in their own way. Our fat-stock shows have given them no assistance. Their weigh-bridges give us the live weight, and we can calculate the carcass weight by assuming the percentage of the latter to the former. I prefer, however, the "block test," and we learn from the Tables at p. 65 that a steer under two years old will gain from birth about 2 lb. daily. If 65 per cent. of this be carcass, his net gain is about $9\frac{1}{10}$ lb. per week. Steers under three years gain from birth a trifle over 1·8 lb. daily; and if 65·6 per cent. of this be carcass, the net gain is about $8\frac{1}{2}$ lb. per week. Steers under four years old gain from birth a trifle under 1·6 lb. daily; and if 69·6 per cent. of this be carcass, their net gain is about 7·7 lb. per week. We may ascertain further from the statistics that small breeds like Devons may almost equal the larger ones in their increase up to the age of about two years; and we may further conclude that ordinary bullocks—the cattle of commerce, so to speak—would fall behind at three to four years old faster than a big show bullock, which is selected in some measure for his size and capacity of growth. All this affords "food for reflection," but we are still left in the dark, in spite of the shows, in regard to the quality of the increase at the respective ages and the cost of producing it. In the present crude state of affairs, we must go to the slaughter-houses and butchers' shops for information as to the quality of the meat, and we must go to America to learn its cost. On this latter point we may take a lesson from the Chicago exhibitions, which have certainly done more than our own to educate the breeders and feeders of stock. After examining the information given under the head of "Cost of Production," an American professor stated, in the *Albany Cultivator*, that the carcass increase of steers between two and three years old is obtained at a cost of 50 per cent. more than that in the carcasses of animals under two years old. The *National Live Stock Journal*, of Chicago, published some figures after one of the shows to illustrate the extra cost as animals grow older. Nine fattening bullocks weighed at the end of their first year 906 lb. average, the cost having been $1\frac{3}{4}$ d. per pound; in the second year five of them gained an average of 566 lb. each, at a cost of 4d. per pound; and in the third year two gained 650 lb. each, at a cost of $6\frac{1}{4}$ d. per pound.

The object of all fat-stock shows must be, in the words of the founders of the Smithfield Club, to encourage the supply of the "cheapest and best meat." There can be no doubt that the cheapest meat is the youngest; and in regard to the best, that is a matter for consumers to decide.

It is quite in accordance with practice, as well as science, that the quality of "young meat" should vary with the feeding.

Ample evidence exists that it may be well fed and made ripe and firm by proper management. The same remark, in fact, applies to all sorts of meat, whatever the breed and age may be. A rasher of maize-fed bacon, swimming in oily fat, will hardly please refined tastes. It is within the power of the scientific feeder to balance his rations with a view to producing milk, flesh, fat, or lean. And he may produce firm or oily fat, hard or tender flesh. Barley or maize meal, malt or rice meal, for example, are all too rich in carbonaceous constituents and too poor in albuminoids, and they should, therefore, be mixed with such foods as linseed cake, decorticated cotton cake, or bean meal, which are all rich in nitrogenous ingredients.

The German experiments have thrown some light on the chemistry of stock-feeding, but I must not venture beyond my limits as a practical writer. I may, however, refer my readers to the elaborate experiments on the feeding of animals at Rothamsted, and to the paper by Sir John B. Lawes and Dr. Gilbert "On the Composition of Oxen, Sheep, and Pigs" (*Journal*, Vol. XXI., 1st Series, 1861).

The stock-feeder will do well to acquaint himself with the science of his subject, and to act in a cautious and tentative manner as an experimenter, trusting more to the direct evidence of his own trials, and of the successful stock-feeding of other people, than to the composition of the carcasses of animals, or the analyses of the substances on which they feed.

I ought, perhaps, to mention here that a paper was written by Dr. Sprague, at the request of the United States Department of Agriculture, in which the power that breeders and feeders may exert in developing particular qualities in meat is handled in a very interesting manner, from a physiological standpoint. Writing of marbled beef—that is, beef having the fat distributed among the fibres of the muscles instead of being laid on irregularly in lumps—he points out the improvement which has been effected in the flesh of all our domesticated meat-producing animals, and their increased capacity for laying on flesh; and, after showing that flesh and frame are alike pliable in the breeder's hands, he declares that they have not sufficiently attended to the quality of meat, to the structure of fibre and muscle, and to the marbling of the flesh. Meat at the best contains a large proportion of fat so largely interspersed with the lean that those who object to fat cannot help swallowing a large part of it with the lean, though they may not know it. The Rothamsted experiments have shown that "of dry fat, the entire body of a fat calf contains $14\frac{1}{2}$ per cent.;" that of a fat ox twice as much, or 30 per cent. The same rule holds

good of all animals, young and old. A fat lamb contains only $28\frac{1}{2}$ per cent. of dry fat, a fat sheep $35\frac{1}{2}$ per cent.; and as to pigs, young ones, killed as porkers, lay on much less fat than bacon hogs. Those persons, therefore, who have no great predilection for fat should eat their meat at an age when it contains the least of it—that is, when young.

I hope the details given in this article will be found sufficient for the general guidance of those who may seek in it for some useful hints derived from practical observation and experience: the science of my subject I must leave in other hands.

HENRY EVERSHED.

THE FOOD OF OUR AGRICULTURAL CROPS.

If a person were asked what events had produced the greatest influence upon agriculture in Great Britain during the last half-century, he would, undoubtedly, say the establishment of the Royal Agricultural Society of England, and the publication of Baron Liebig's work upon agricultural chemistry. It is somewhat remarkable that these two events took place almost contemporaneously, the Royal Agricultural Society having been founded in 1838, and Baron Liebig's work published in 1840.

The first number of the Journal of the Society, which was issued in April 1839, contains an article "Upon the Present State of Agriculture as a Science in England," by the late Philip Pusey; and we may feel tolerably sure that this acute observer knew everything that was to be known in England on this subject. In speaking of bones as a manure, he says that farmers complain of the bones supplied to them having been previously boiled, and, consequently, that they have been fraudulently deprived of the oil they contained; with regard to which, Mr. Pusey suggests, with his usual sagacity, that the manuring properties of the bones are probably increased rather than diminished by the loss of the oil. Neither in Mr. Pusey's article, nor in an article by the Rev. W. L. Rham, "On the Analysis of Soils," published in the same Journal, and for which the author was awarded a prize of 20*l.*, do the terms phosphate, potash, nitrogen, ammonia, or nitric acid occur. These and a great number of similar terms which represent substances of the highest importance to agriculture, and which, to the farmers

of the present day, have become "household words," formed no part of the science of agriculture at the time Mr. Pusey wrote.

In accordance with the view generally entertained, Mr. Rham considered that the vegetable matter of the soil known by the name of humus was the source of its fertility. He says that real humus is a very complex substance, and suggests that our greatest chemists should make investigations into its nature. It was an immense step in advance when Boussingault, who was a most accurate chemist as well as a practical farmer, published analyses of the various crops grown upon his farm, and discussed the question of the fertility and exhaustion of the soil in connection with the export and restoration of definite chemical compounds. Having a considerable area of irrigated meadows attached to his farm, he considered that the hay grown on these meadows was sufficient to restore the ingredients exported from his arable land in corn and animal products, and his employment of what we now call artificial manures was confined to the application of gypsum to clover.

After the publication of Liebig's work, an immense number of experiments with artificial manures were carried out in this country. While some people recommended that the exact proportion of each ingredient exported from the farm in the produce should be returned in the artificial manure, others argued that only those substances should be returned which analysis of the soil proved to be wanting. The great battle, however, was over the employment of nitrogen. Being the most costly ingredient in an artificial manure, the necessity for its use became a question of great agricultural importance. Some contended that, provided the land was furnished with the necessary mineral ingredients, the plant could obtain all the nitrogen it required from the atmosphere; while others asserted that no amount of mineral food would prevent the yield from declining unless nitrogen in some form was used with the minerals. In an article published in this Journal, Mr. Pusey summed up the conclusions derived from innumerable experiments in the following remark: "Ammonia for corn, phosphorus for roots," which, although not representing any scientific law, furnished in the simplest and plainest language a most valuable practical rule for farmers.

So little was known regarding the relation to the soil of some of the most important ingredients of growth, that, at the suggestion of an eminent chemist, a patent was taken out for fusing phosphate of lime and potash with other substances into a glass, to prevent them from being washed out of the soil; while at the same time some one else was bringing chemical action to

bear upon phosphates to increase their solubility. By degrees it became known that the three most important foods of plants—phosphoric acid, potash, and nitrogen—exist in the soil in a very insoluble form, and that by the action of the roots of plants the two former substances are dissolved, and taken up as food; while organic nitrogen, called humus by the older chemists, is the source of the nitric acid found in the water of the soil; and that, until the nitrogenous compound of the humus has become nitrified, it possesses comparatively small manuring properties. When it was found that the drainage-water taken from the soil when the crop is in the full vigour of its growth contains no nitric acid, while at all other times it does contain it in more or less quantities, there could no longer be any doubt that nitric acid is the chief source of the nitrogen in some of our crops, and that the necessity for the application of nitrogen in a manure depends upon the capability of the soil to liberate a sufficient amount of nitric acid to supply the wants of the crop. It is evident that nitric acid and its salts, such as the nitrates of soda, potash, and lime, being very soluble in water, and forming no fixed compounds with the soil, like phosphoric acid or potash, cannot accumulate; what is not taken up by the crops is more or less completely washed out during the winter. Each year, therefore, fresh quantities of nitric acid are formed, partly from the organic matter existing in the soil and partly from that supplied in the ordinary manures of the farm. The quantity available for the crop varies every year. For instance, after a very wet winter and spring a wheat crop may find very little left for its use when its active growth takes place in the spring, and must depend upon the amount liberated in the soil during its growth, or upon a direct application of nitrates.

The immense importance of dry weather in preventing the loss of nitric acid is well illustrated by the season of 1853-54. The wheat crop of 1854 was one of the typical great crops of the present century, the yield being very large upon all sorts of land, from the lightest to the heaviest; and yet, if we were to judge by the climate of the summer months, which are supposed to decide the yield of wheat, we should have expected that the crop would be below the average. May was cold and wet, June cold and sunless, July had not one day of summer heat, and the harvest was ten days or a fortnight later than usual. But now let us turn to the winter months of the same season. From seed-time to the end of April we find a great deficiency of rain, only half the average amount having fallen. In May there was a great excess of rain, which came

just when it was wanted, and was followed by less than the average rainfall during the next three months. This unusually large crop of wheat, grown under adverse summer conditions, can therefore only be accounted for by the fact that the large amount of nitric acid which was formed in the soil, and had accumulated there owing to the extremely dry weather prevailing from seed-time to harvest, was available for the use of the crop in the most important period of its growth. A great increase in the available nitric acid in the soil was evidently the cause, in the same year, of the exceedingly large yield of wheat (amounting to 21 bushels per acre) on our permanently unmanured land; for we know that at any time, by the application of nitrate of soda, the crops on this land can be increased by several bushels per acre.

The use of phosphates for root crops has sometimes led to the idea that these crops and the cereal crops do not obtain their nitrogen from the same source, and that the former are less dependent upon a supply of nitric acid in the soil. It is quite true that full agricultural crops of roots are frequently grown by the use of a manure which contains a soluble phosphate, and no nitrogen; but in these cases the soil must be equal to furnishing the amount of nitric acid required by the crop. It is known that the formation of nitric acid in the soil is much more rapid in the summer and autumn than at other times, and that constant stirring the soil so as to expose fresh surfaces to the air increases this formation. Root crops, beginning their active growth at the time when cereals are ripening, can obtain from the soil large quantities of nitric acid which were not available for the corn crops; the great exhaustion of the soil which follows the removal of a large root crop also proving that it obtains its nitrogen from the same source as the cereals. It is somewhat remarkable that maize, which is so largely grown in the United States, is said to be mostly benefited by the application of mineral manures, and to derive its nitrogen from the atmosphere, and not from the soil. Owing to the growth of maize taking place during the summer and autumn, it would, like our root crops, be less dependent upon a direct supply of nitrogen in manures; but, at the same time, it is reasonable to suppose that the source of the nitrogen in maize is the same as that of other cereal crops. So far as our crops are concerned, the evidence at our command points to the conclusion that our cereal crops, pasture-grasses, and various root crops, depend for their supply of nitrogen almost entirely upon the nitric acid in the soil.

There is a very important class of plants, included under the

general term "leguminous," which we find in more or less abundance in our permanent pastures, and which form part of our rotations. Some of these are annuals, some bi-annuals, some perennials; some are grown for their seeds, some for fodder; but, for whatever purpose they are grown, these plants possess properties which distinguish them from all others grown in rotation. In their stems, leaves, and seeds, they contain larger amounts of nitrogen than the other crops, while at the same time they do not respond to an application of nitrogen in manure, as do the other crops in a rotation. It is true, I have said, that under ordinary conditions of farming root crops can be grown without a direct application of nitrogen; but if we reduce the condition of the land by the removal of one or two of these, it will be seen that it is impossible to grow another heavy crop of roots without a very liberal supply of nitrogenous manure. No such result follows the application of nitrogen to a leguminous crop. If we apply a dressing of nitrate of soda to a mixed crop of rye-grass and clover, we can increase the rye-grass to almost any extent, but not the clover. There is no difficulty in growing full crops of grain or roots year after year upon the same soil, provided we use appropriate and sufficient manures; but no combination of manures has enabled us to grow continuous crops of red clover upon the same arable land; nor have our attempts to grow continuous bean crops been much more successful. So uncertain, indeed, has been the effect obtained by the application of various artificial manures to this class of crops, that farmers have generally come to the conclusion not to manure them, but to reserve the application of manures to those crops which can be depended upon to produce a profitable return.

Although the source of the nitrogen in leguminous plants has been the subject of scientific inquiries since the beginning of the present century, it is only since the various substances which constitute the food of plants have been produced in a separate form as chemical salts, and have been applied separately or combined to the various crops grown in rotation, that the distinctive character of the leguminous crops in regard to the effect of nitrogenous manures has been clearly brought out. There is no doubt that the great influence of such a substance as nitrate of soda upon corn crops and roots, and its want of effect upon leguminous crops, has led to the conclusion that the latter plants obtain their nitrogen from the atmosphere. Experiments carried out with the utmost care upon leguminous plants provided with abundance of mineral food only, and with air from which every compound of nitrogen had been extracted,

established the fact that, under these conditions, no increase of nitrogen in the plants takes place.

In Germany, in 1883, Hellriegel commenced some experiments with various plants in pots: he used washed sand with mineral manures, adding to some, but not to all, combined nitrogen, generally as a nitrate, and found that, with most of the plants, the increase of growth was in proportion to the amount of nitric acid supplied, but that the leguminous plants did not derive the same benefit from the nitrogenous manures as did the others. He then applied to his plants an extract from a fertile soil, and found that some of the leguminous plants, but not all of them, grew luxuriantly under this treatment: lupins, for instance, would not grow with the soil-extract. He then took an extract from a soil where they were growing luxuriantly, and obtained good growth. Again, if he sterilised the soil-extract so as to destroy the organisms in it, it ceased to be beneficial. Hellriegel found that the plants contained much larger quantities of nitrogen than there were in the soil-extract, while the amount in the plants was much too great to be attributed to errors of analysis. These experiments were so interesting and important that we considered it desirable to carry out some of a similar character, and this we have been doing for the last two years, confirming in every respect the results obtained by Hellriegel.

It appears probable that although the leguminous plants do not directly utilise the free nitrogen of the atmosphere, they do in some way obtain nitrogen from it through the medium of lower organisms, the development of which is, somehow, connected with the growth of the leguminous plants. The question which I now propose to consider is the bearing which these experiments have upon practical agriculture. Are we to suppose that the large quantity of nitrogen which these plants are known to contain has its origin in the atmosphere, and not in the soil? This is a very important question, as the opinion has already been expressed that we need not trouble ourselves about the source of the nitrogen in our leguminous crops, as it all comes from the atmosphere. Granting that the experiments recorded are perfectly trustworthy and correct—that, in the absence of nitrogen in the sand in which the seed is sown, and with a very minute amount of nitrogen supplied in the extract from a fertile soil, a gain of nitrogen in the plant takes place, we have still to inquire whether the same process goes on in an ordinary agricultural soil which contains nitrogen in more or less abundance.

In 1860, we published in this Journal some experiments

upon the growth of red clover, the result of which showed that under no conditions of manuring could we continue year after year to grow this crop upon the same arable soil. A few years before this we had sown some red clover upon a piece of ground which had been used as a kitchen-garden for several centuries, and had, most probably, never before grown red clover. The first crops were exceedingly large, and the seed sown in 1854 did not require to be re-sown until 1860; and even now, at the end of thirty-six years, although the seed generally requires to be re-sown every two or three years, and the crops have become much smaller than they were at first, still they are quite as good as the ordinary farm crops, and the average yield over the whole period we estimate to have been nearly 3 tons of hay per acre per annum, and the amount of nitrogen carried off in the hay to have been 163 lb. per acre per annum. Samples of the soil were taken in 1857, and again in 1879—comprising twenty-one years of growth. The loss of nitrogen in the first nine inches was estimated at 2,732 lb. per acre; this was less by one-fourth than the quantity removed by the clover during that period. Unfortunately, in 1857 we did not take samples of the soil below the first nine inches; we are, therefore, unable to measure the loss which has taken place in the soil below this depth. As however, the subsoil is very rich in nitrogen, and the roots of clover are known to penetrate deeply into it, there can be very little doubt that the crop has taken nitrogen from this source, or that the soil is the real source of all the nitrogen removed in the crops. Notwithstanding the very large removal of nitrogen from this soil, it is still richer in this substance than the farmland growing the permanent wheat crop, which has received 14 tons of farmyard dung per acre every year for the last forty-six years. This experiment is highly interesting, as proving that it is the want of food of the right sort in our farm soils which prevents our growing red clover more frequently upon them; it also shows that a vast amount of fertility may accumulate in a soil which has been used as a garden for a very long period.

Upon some old pasture-land mineral manures, but no nitrogen, have been applied every year since 1856. Under this application the crop of hay removed annually has been considerably larger than that removed from the unmanured land, and the effect of the minerals has been largely to increase the leguminous herbage, so that it constitutes about one-fifth of the whole crop; while upon the unmanured land not more than 8 per cent. is leguminous herbage. At the end of twenty years, careful analyses of the soil of both plots were made, and it was found that the first nine inches of the plot receiving the mineral

manures had lost upon the acre 506 lb. more nitrogen than the unmanured land; this would be equal to the annual loss of 25·3 lb. The analysis of the hay removed from the two plots showed that that of the mineral plot contained 23·6 lb. more nitrogen than the hay of the unmanured plot, a quantity corresponding very closely with the greater loss of nitrogen in the mineral manured soil. Too much reliance must not, however, be placed upon so complicated an operation as soil analysis, though the evidence points to the conclusion that the larger amount of nitrogen taken off the land by the leguminous herbage on the mineral plot was derived from the soil, and not from the atmosphere.

Although we found it impossible to grow red clover year after year upon the same arable soil of the farm, whatever might be the amount or composition of the manure applied, we found no difficulty in growing other leguminous plants upon the clover-sick land—the importance of which fact is very obvious, as it enables us to continue removing large quantities of nitrogen in leguminous crops year after year, instead of having to wait for some years until the land will again grow red clover.

It is evident, if the soil of our arable fields is the source of nitrogen, and the manures which we apply to them do not contain any, that, sooner or later, the stock of nitrogen in our soils will be greatly diminished; even to an extent which may eventually be measured by analysis. It is, unfortunately, the case that leguminous crops, such as lucerne, sainfoin, &c., which carry off the largest amount of nitrogen, are also those whose roots penetrate the deepest down into the subsoil; also, that the subsoil of my experimental fields varies in character so much, even where samples are taken with the utmost care, and at no great distance apart, that at present any comparative measurements of the loss of nitrogen in the soil are not to be trusted, and the experiments must be carried on for some years more before we can expect to give a satisfactory answer to this important question.

The general results of our experiments appear to show that while mineral manures, especially those containing potash, produce a large increase in leguminous crops, neither salts of ammonia, nitrate of soda, nor rape-cake, which furnish organic nitrogen, appear to have any decided influence upon them. This indicates a very distinct difference in the source from which the cereal and leguminous crops obtain their nitrogen; for, in the same field, and within a few feet of each other, nitrate of soda alone applied to the continuous barley crop has produced an average of 33 bushels per acre for thirty-six years in

succession. The absence of effect upon the leguminous crops from the application of nitrate of soda as a top-dressing is the more remarkable as analyses of the subsoil, where lucerne (the roots of which have penetrated nine feet from the surface) has been growing for some years, showed that considerable quantities of nitric acid had been removed; while upon a soil where white clover had been grown, the subsoil below the reach of the roots was much richer in nitric acid than it was within the range of the roots. Comparing these results with those on the adjoining soil and subsoil, where wheat and fallow had been under experiment for many years, there appeared to have been greater production of nitric acid in the soil where the white clover had grown than where the wheat grew; and, at the same time, the subsoil where the lucerne was growing was poorer in nitric acid than the subsoil of the white clover or of the wheat-land. In one year as much as 300 lb. of nitrogen per acre has been taken off in the lucerne, although the land has received no manure containing nitrogen for thirty years; while the wheat crop alternating with fallow cannot collect one-tenth of that quantity.

It would appear from these results, that during the growth and decay of leguminous crops considerable amounts of nitrates are formed and taken up by the plants, but the actual source of these nitrates is not yet clearly established. One-quarter of the adjoining field has grown continuous barley crops, nitrate of soda being used every year as a top-dressing; on the other three-quarters of the field barley is also grown, but red clover is occasionally sown with the barley upon one of these quarters, so that about once in eight years each of the three quarters has grown red clover instead of barley. The clover is made into hay, and carried off, and the barley which follows the clover receives no manure. The general result of this is, that the barley following the clover is quite as good a crop as the continuous barley manured with the nitrate of soda; and although the clover has carried away very much larger quantities of nitrogen than the barley, the first nine inches of the clover-soil shows by analysis a considerably larger amount of nitrogen than the barley-land. More nitrogen is carried off in the clover than in the barley, and more nitrogen is found in the top soil of the clover-land than in that of the barley; and this fact is quite in accordance with the experience of practical farmers, though they draw their conclusions from the increase of the succeeding crop, and not from analysis of the soil. We have hitherto, however, been unsuccessful in our attempts to ascertain if the increase of nitrogen in the top soil has been obtained by the clover from the subsoil. Although an attempt to grow beans continuously in a field

set apart for that purpose did not fail so quickly, or from the same causes, as the experiments with red clover, still the result of thirty-two years' experience with beans established the fact that, under no condition of manuring could what might be called good agricultural crops be obtained year after year. It may be said that my land is not what farmers would call "bean-land;" still, it is heavy, with a clay subsoil, and at first it grew good crops. The land, however, appeared to get "tired" of the crop, and after thirty-two years' trial we considered that nothing more could be learnt by a continuation of this experiment. We therefore decided to sow the field with barley and red clover, having previously sampled and analysed the soil of the various plots with great care. Speaking generally, the soil had lost a good deal of its original fertility, and both the top soil and subsoil were especially poor in nitric acid; agriculturally, the field might be said to have been "run out," and to have no condition left in it. The clover, which was sown with the barley, was so luxuriant that the growth of the latter was greatly impeded. The leaf was remarkable for its beauty, and had a colour which I had never before noticed in any ordinary field of clover. It was mown for hay the two following years, and yielded very luxuriant crops. Upon some portions of this field no manure of any sort had been applied from the commencement of the experiments in 1848, and in some years the beans would not return much more than the seed sown; and yet upon this same land very large crops of clover were grown, estimated to have removed 281 lb. of nitrogen per acre, while at the same time the nitrogen in the top soil had largely increased. Altogether, between the crop and the soil, something like 500 lb. of nitrogen are estimated to have been obtained from some source or other.

In 1848, some acres of land were set apart for experiments upon a rotation of crops. Part of this land has been kept entirely without manure, another part has received a mineral manure, and a third part has been highly manured with minerals, salts of ammonia, and rape-cake. The ordinary four-course rotation of turnips, barley, clover, and wheat, has been followed upon one-half of the experiment; and upon the other half the same crops have been grown, only excluding the leguminous crop, instead of which, a summer fallow has been taken, one of the main objects of these experiments being to ascertain the influence of a leguminous crop upon the other crops in a rotation as compared with a fallow. As it was found impossible to make the clover crop grow every fourth year, beans were substituted for it. Although we are now in the middle of the eleventh rotation, we are not yet able to give the information we

are seeking with regard to the influence of the leguminous crop, but some very valuable knowledge has been obtained. Altogether, six bean crops and four crops of red clover have been grown. Comparing the wheat which followed the beans with that which followed the fallow, it may be said that the latter was the better crop; and, the better the season for wheat, and the larger the general yield, the greater was the superiority of the fallow wheat. This was clearly shown in the year 1863, when the wheat crop was one of the largest ever grown in this country. The following table gives the produce of the wheat after a summer fallow and after a bean crop:

	Bushels per acre		
	Unmanured	Mineral manures	Highly manured
After fallow . . .	45	46	52½
After beans . . .	34	34½	46
Fallow more than beans .	11	11½	6½

This was the sixteenth year of the experiment, during which period the whole of the crops grown upon the land had been carried away. As we know with something like certainty that the yield of a wheat crop depends greatly upon the amount of nitric acid at its disposal in the soil, it appears probable that the large increase of the wheat crops upon the fallow-land, compared with the bean-land, was due to the beans having taken up nitric acid from the soil. In 1871, the wheat crop was as bad as that of 1863 was good. The yield upon the unmanured land after fallow was 11½ bushels per acre; after beans, 20½ bushels. Upon the land receiving minerals after fallow it was 16 bushels; and after beans, 24 bushels. The season was very wet; and though we may assume that a large amount of nitric acid was washed out of both the bean- and fallow-lands, the wheat upon the bean-land was benefited by the nitrification of the crop-residue of the beans, which would take place during the spring and summer.

It is somewhat remarkable that, upon land which has received no manure for forty years, and from which the whole produce upon it has been carried away, the average of ten crops of barley has been 30 bushels, and of wheat, 28½ bushels. While, therefore, grain crops can manage to find sufficient food in the soil to grow well, none of the so-called "restorative" crops could thrive. The turnips, after the first crop had been carried off, were little larger than radishes, and the next nine crops were valueless. The beans gave only 12 bushels per acre, while the clover in 1874, cut three times, only yielded 1½ tons of hay, although no clover had been grown upon the land for twenty-

three years; the land which had been highly manured every fourth year giving $3\frac{1}{2}$ tons of hay per acre. The wheat after the clover upon the unmanured land was a worse crop than that after the fallow.

From these results, it would appear that the roots and leguminous crops which we alternate with our corn crops are inferior to them in their capacity to collect their food from an unmanured soil; but when food is abundant, they have far greater power to make use of it than the cereal crops. In the 22 tons of swedes grown in 1880, and in the 4 tons of clover-hay grown in 1882 upon the manured rotation plot, much larger amounts of nitrogen and minerals would be found than in a cereal crop. The application of a mineral superphosphate of lime to the root crop every fourth year produced a very marked effect. The last ten crops of unmanured swedes were unable to produce a bulb, while the employment of superphosphate gave a produce of 7 or 8 tons per acre; the influence of the superphosphate was also very decided upon the clover crop, but not upon the beans. With regard to the main question, How far the mineral manure had enabled the leguminous plants to obtain their nitrogen from the atmosphere rather than from the soil, there is, however, at present no available evidence. The average of ten crops of wheat following fallow, and of ten following a leguminous crop, was identical—not quite 33 bushels per acre. Very careful samples of soil have been taken at different times from all the experimental plots, and analyses have been made of the total nitrogen in them, and also of the nitric acid; but although the results are of considerable interest, they do not show distinctly the differences we should expect to find in a soil which has not grown a leguminous crop for so many years, and one which has grown it every fourth year.

Samples of soil taken to the depth of 27 inches after a summer fallow gave considerably more nitric acid than similar samples taken from the land which had grown red clover; this, however, by no means proves conclusively that the clover had taken nitric acid from the soil, for more nitric acid might have been liberated in the fallow ground than in the clover ground. That food of some sort suitable to leguminous plants is accumulating in the fallow ground is shown by the difficulty we have in keeping them from growing on this ground: trefoil will come up, in more or less quantities, in the barley crop, where we cannot get at it; but two years out of the four, in the fallow and in the turnip crop, not a plant is allowed to grow. It creeps along the ground, and ripens its seed before the barley is cut, remaining dormant in the soil until the next corn crop

comes; and it has the same tendency to spread over the permanent wheat- and barley-ground. This fact, taken in connection with the luxuriant growth of the clover upon the field where the bean experiments had been carried on, seems to indicate the formation of some compound in the soil of which we are still ignorant, but which serves as food for leguminous plants. It is evident that this subject opens a wide field for special investigation, and it is fortunate that we possess samples of soil taken with great care from our various experimental fields at different periods, the history of which, in regard to the manures applied and the produce removed, has been recorded for a long series of years.

Although I have only referred to the experiments of Hellriegel upon the fixation of nitrogen by leguminous plants, and the repetition of these experiments by ourselves, numerous others upon the same subject have been carried out, in France, Germany, and the United States, which appear to prove that soils without vegetation fix large quantities of nitrogen; and also that, in those soils where plants not of the leguminous order have been grown, still more nitrogen is fixed. As a deduction from all these experiments, it has been argued that compensation must exist somewhere, otherwise the human race would, sooner or later, starve, owing to the exhaustion of the soil. If we accepted this idea, we should have to ignore the results of the last fifty years' experiments, and go back to the view expressed long ago, that plants can obtain all the nitrogen they require from the atmosphere, provided they are furnished with sufficient mineral food. As far as regards agricultural land under our ordinary grain or root crops, we have no evidence to show that the soil or the plant derives any appreciable amount of nitrogen from the atmosphere, beyond what is furnished by rain or dew. Where all artificial supplies of nitrogen in manures have been withheld for between forty and fifty years, and an abundance of minerals has been furnished, the yield of the crops is now so small, and the amount of nitrogen which they carry away bears so small a proportion to the quantity stored up in the soil within reach of their roots, that any exact comparison of the nitrogen carried off in the crops, and washed out of the soil by drainage, with the loss of nitrogen in the soil as determined by direct analyses, is hardly possible; but, as far as we can judge, the soil has lost about as much as the crop and drains have removed.

Turning again to the experiments on leguminous crops, we have in the garden soil evidence that red clover takes very large quantities of nitrogen from the soil—in fact, most probably the whole which the crop contains. On the other hand, we have the

experiment of sand containing no nitrogen, but supplied with minerals, and with a very minute quantity of nitrogen taken from a fertile soil, where leguminous plants have increased considerably in nitrogen. Interesting as these experiments are, they fail to explain the behaviour of leguminous crops in an ordinary agricultural soil. My garden soil is far higher in fertility than any which a farmer is likely to cultivate, unless he happens to farm one of the black soils of Russia; and he could not afford to cultivate a sand free from all vegetable matter and nitrogen, such as was used in the pot experiments. From the opposite results obtained in the garden soil and in the sand, are we to assume that the power of leguminous plants to obtain nitrogen from the atmosphere is dependent upon, and in proportion to, their inability to obtain it in sufficient quantity from the soil; and that it is only as soils become more and more exhausted of their fertility that this restorative process comes into force?

It is exceedingly difficult to account for the large crops of clover grown upon the unmanured bean-land. The amount of nitrogen taken up by the crop was very great, but it must not be forgotten that the quantity of mineral matter taken up was very much larger, as we may consider that the proportion in the clover-plant is about four parts of minerals to one of nitrogen. These minerals must have come from the soil, and must have accumulated there, in some form available for the clover, during the period when beans were grown upon the land. Whether at the same time some compounds of nitrogen suitable for the clover were also formed we have no evidence to show. An attempt to grow red clover last year where it was grown four years previously failed upon all the rotation experiments. We did succeed in growing it in 1886, after we had grown a large crop in 1882; but in the latter year there was a good deal of disease in the crop upon the highly-manured land, but none on the land which received only mineral manures.

From what I have said, it must be apparent that our knowledge at present of this important subject does not go beyond the facts that leguminous plants take nitrogen in large quantities from the soil, and that, under special conditions, they can obtain it from the atmosphere through the agency of micro-organisms; but we have no evidence to show that they do so when grown in the ordinary course of agriculture. The most probable means by which a solution of this problem can be arrived at, is to grow leguminous crops upon ordinary agricultural land with a liberal supply of mineral manures; in the course of time, the stock of nitrogen remaining in the soil must

decide the question one way or the other. It is very fortunate that so large an area in our various experimental fields has been kept free from all nitrogen in manures, and, had we known that land which had become "clover-sick" would grow other leguminous plants perfectly well, we should not have wasted twenty years in the hopeless attempt to grow clover, and we should have been in advance of our present position by the same period.

At the beginning of this paper I made a few remarks upon the position of agricultural science at the time of the publication of the first number of this Journal. Mr. Rham, in his prize essay, considered humus to be the chief source of fertility in soils; it is quite as much so now as it was then. He also said it was a complex substance, which should occupy the attention of chemists; and it has been the subject of investigations by them. It may now be desirable to pass in review, very shortly, the knowledge we have acquired regarding the food of our agricultural crops. Humus (in which term I include all vegetable matter in a certain state of decay) is very insoluble in water; but sooner or later, it assumes the form of nitric acid, which combines with lime or other alkaline substances in the soil, and then becomes very soluble in water. These compounds rise and fall with the water in the soil, coming to the surface in dry weather, and passing into the drains, in the absence of growing vegetation, in wet weather. When a crop is in the full vigour of growth, the soil-water may contain no nitrates, the crop having taken them all up; but at all other times the soil-water contains more or less nitrates. Being soluble in water, and entering into no combination with the soil, nitrates cannot accumulate. Each year fresh nitrates are formed from the decomposition of the humus, the fertility of land depending largely upon the amount of nitric acid liberated every year. What we call "condition," is so much added to the stock of organic matter, which in the course of a few years is decomposed, yielding nitric acid and mineral substances.

It appears probable that our grain and root crops take up the greater portion, or, perhaps, the whole of their nitrogen, in the form of nitrates, and, provided the necessary mineral food is in the soil, the growth of these crops depends upon the amount of nitric acid which is available. The great value placed upon nitrate of soda as a manure for corn crops is a sufficient proof that the necessary amount of mineral food exists in the soil. The main object of agriculture is to produce crops which yield large quantities of starch or sugar. In Great Britain, wheat, barley, oats, and potatoes yield the starch, and the root crops

the sugar; in other countries additional crops are grown, such as rice, maize, sugar-cane, sugar-beet, &c.; and it may be said that the amount of starch or sugar which we are able to produce upon a given area of land, depends greatly upon the amount of nitric acid which the crop can obtain from the soil. Mineral substances, however, are quite as essential to the growth of a crop as nitrogen, and, amongst these, phosphoric acid and potash are of the greatest importance. Lime is largely taken up by some crops; and where potash is deficient and soda is abundant, the latter substance, although it cannot take the place of potash in its most important functions, can at all events aid in promoting the growth of crops.

It is extremely important to understand clearly the capacity of our crops to obtain a supply of mineral food from the soil. In our four-course rotation, which has been kept entirely without manure for forty years, ten crops of wheat and ten of barley, grown in a rotation with swedes and a leguminous crop, have given an average yield of 28 bushels of wheat and 30 of barley. Each of these crops would carry off every year 15 to 20 lb. of phosphoric acid; that is, as much altogether as would be equal to 600 or 700 lb. of phosphate of lime. Between each crop of wheat and barley swedes are sown, but no bulbs will form, and the produce is only a few hundredweights per acre. It is evident that this crop cannot take up phosphate of lime from an unmanured soil, and that the growth of the swedes was arrested from the want of phosphates, and not from that of other substances, as the application of a mineral phosphate in the adjoining experiment was sufficient to produce a fair crop. Liebig suggested that the extension of the growth of root crops in Great Britain was due to a want of sufficient phosphates in the soil to grow more corn crops, analysis having shown that root crops contain less phosphates than corn crops. At the time Liebig wrote, the capacity of one crop to take an important food from the soil, and the inability of another crop to take it, was altogether unknown.

When we consider that cereal grain crops furnish by far the largest amount of food to the whole human race, we cannot but recognise how essential is the power which they possess—first, of obtaining so large an amount of their food from an ordinary unmanured soil, and, secondly, of growing continuously upon the same soil—neither of which properties is possessed by the other crops. The difficulty which root crops have of obtaining mineral food from the soil, has led to the idea that they are not dependent upon the soil for a supply of nitrogen, but can obtain it from the atmosphere. There is, however, every reason

to suppose that they derive their nitrogen from nitric acid in the soil, and require even more than the cereal crops. If they are less dependent upon an artificial supply of nitrogen than corn crops, it is because they grow during the summer and autumn, when nitrification of the soil is most active; this, and the constant stirring of the soil, enables them to obtain the necessary supply, independent of any aid from manures.

Leguminous crops possess qualities quite distinct from the other crops grown in a rotation: they are more dependent upon soil and climate, and less upon a direct supply of manure. When they are not grown, the food they require accumulates in the soil, and, where one kind of leguminous plant has exhausted the soil of its own special food, another may find in abundance food suitable for its own growth. How far these exceptional properties in leguminous plants are due to special compounds in the soil, or to special micro-organisms which prepare their food, is at present quite unknown; and while acknowledging their great value to agriculture as restorative crops, we must admit that science is not yet in a position to give a full explanation of these exceptional properties.

We see, therefore, that the economy of a rotation of crops is due to the special functions performed by the different crops. We have, first, the corn crops, which possess the remarkable power of obtaining a supply of food from an ordinary unmanured soil, and also of growing upon the same soil for very long periods. They derive their nitrogen from the soil, chiefly in the form of nitrates; and although the crops do not carry off large quantities, they are indirectly responsible for a great loss of nitrogen, owing to the early period of the year at which they cease to take up nitrates from the soil. The root crops, on the contrary, can obtain very little food from an unmanured soil, and are largely dependent upon a supply in manure, especially of phosphates. But they also take large quantities of nitrogen from the soil, chiefly as nitrates; and owing to their growth taking place in the summer and autumn, more nitrates are formed in the soil, and taken up by the crops, and there is less loss than with the corn crops. As cleaning crops, also, the value of roots is very great, especially to the corn crops. The leguminous crops, and especially those which are sown with the corn crops, such as the red and white clovers, are great restorers of fertility, although there is still wanting a clear proof that, under the ordinary conditions of agriculture, these crops obtain their nitrogen from the atmosphere. By sending their roots deep into the subsoil, and covering the land with green vegetation for so long a period, they are able to collect

large amounts of food not available to corn crops, the effects of which we find in the increased fertility of our surface soils.

I have now attempted to assign to each of the crops its respective influence in a rotation, so far as concerns their action upon the soil. With the immense amount and variety of artificial manures at our disposal, and with the knowledge which we now possess regarding the food of our crops, a rotation is no longer an absolute necessity; at the same time, I am disposed to think that the advantage of a rotation in which both root and leguminous crops are grown with more or less frequency in conjunction with corn crops, and which practice has so long adopted, is confirmed by the evidence I have brought forward, as being an economical system, suitable for the agriculture of this country.

J. B. LAWES.

THE DISPOSAL OF SEWAGE BY SMALL TOWNS AND VILLAGES.

Now that the sewage question has run through the wild extravagance of its early days, and sewage has come to be regarded by all sensible people simply as a nuisance to be got rid of, rather than being in itself a mine of wealth, the solution of the problem has become an easier matter. The primary question is no longer how to extract the small amount of fertilising matter it contains, with the idea of making a fortune by sewage-farming, or a valuable artificial manure, but how to rid ourselves of the sewage that it may do the smallest amount of harm at the least possible cost.

Those are on the safe side who regard sewage as an unmitigated nuisance, from the first moment it leaves the house, until it eventually escapes into the sea. To sewer a large town often presents grave engineering difficulties; to properly sewer a scattered village is frequently an impossibility. Then the question arises, Are sewers necessary in our country villages? The sewage may pollute the river or watercourse into which it runs, but it is only dangerous when it poisons the water-supply of the inhabitants. If the former pollution is extensive, riparian owners can put Acts of Parliament in motion to restrain it; if the latter, it rests with the Local Authority of the district to remove the evil.

Now it is manifest that the most serious contamination must arise in those localities where the drinking-water of the village

is derived from shallow springs. Where the water-supply is deep, unless sewage escapes directly into the well, its percolation through 50, or even 20 feet of earth, must deprive the sewage of all its dangerous impurities long before it reaches the water-bearing stratum. Upon sewage-farms, where large quantities of crude sewage have been poured for years, the 3 or 4 feet of surface-soil still retains its power of filtering the sewage, so that the water escapes clear and pure from the under-drains. But where there is a shallow water-bearing stratum ready to burst out on every hillside, and these land-springs form the water-supply of the village, the danger of sewage contamination is serious and frequent.

Where no fear of polluting the water-supply exists, attempts to sewer rural villages can hardly be justified. Not only is the expense great for a small and unequal sanitary gain, but it is seldom that the houses in a parish are so clustered together that all can be connected with the sewers. The means of flushing the drains are not always handy; and, unless sewers are properly flushed and ventilated, they become foul and offensive, and sometimes are blocked. For cottages, the dry-earth closet seems the most rational way of dealing with faecal matter, and the house-slops can be easily emptied into a hole in the garden, from which under-drains might enrich the subsoil, as recommended by the late Mr. James Howard. But earth closets must be under constant supervision, and all slops must be rigorously excluded, or the closets soon become extremely filthy. Where the cottages in a village mainly belong to one proprietor, it answers well to have a man employed to remove once or twice a week the contents of the closet, and supply fresh earth; and if the Sanitary Authority favour the dry-earth system, there is no reason why they should not contract, or employ an officer for its superintendence and scavenging, in the same way that they now pay for flushing and inspecting the sewers within their district.

In treating of the disposal of the sewage of small towns and large villages, it is not necessary to refer in any detail to the construction or plan of the sewers themselves, but, rather, to the means employed to purify the sewage. Most of the attempts at village filtration are of the most primitive character. A grating to catch the flocculent refuse, and one or two tanks filled with stones, gravel, or sand—called by courtesy filter-beds—afford little means of clarification, much less purification. But they may be of essential service in removing the most unsightly rubbish and the grosser solids, which so often disfigure and discolour the stream which eventually receives the sewage. Filter-beds

of charcoal, iron, ferozone, and such-like substances, which receive the effluent water *after* it has passed through the land, may be extremely useful, and probably represent the perfection of sewage disposal.

The idea of small quantities of sewage being utilised for growing vegetables or common farm-crops other than grass, has been little favoured of late years. It is the curse of most sewage-farms that they have to deal with the largest volume of sewage when they want it least; but should the amount of sewage be in itself small, when it is most wanted there is scarcely any to be had. It is, therefore, found that osiers, or ash-poles, which require little attention, and grow away whether the beds are flooded a foot deep, or the sewage trickles down the carriers in intermittent dribbles, are the best crops for sewage-beds. Osiers, no doubt, require the rubbish to be kept down when they are young plants, and in the early stages of their growth; but ash-poles will grow for years without any expense beyond cleansing the carriers and regulating the flow of the sewage—and that must be done, not for the benefit of the poles, but for the proper filtration of the sewage.

One of the evils predicted from the growth of osiers, was the certainty that their rootlets would speedily choke the under-drains. Although some osier beds have been irrigated with crude sewage for many years, the drain-pipes still run as freely as when they were first laid down.

Much difficulty has been experienced in finding out the localities in which villages have been sewered. Here and there, from more or less remote parts of the kingdom, tidings come that a small attempt at dealing with sewage has been most successful; but it often turns out to be some new chemical or mineral substance which is supposed to have done wonders in a filter-bed or settling-tank. For the most part, the Rural Sanitary Authorities which have attempted to dispose of sewage have followed the main features of the irrigation practised in the *Briaworth Union*, Northamptonshire—a Union which bids fair to become as celebrated for the successful removal of village sewage as it has long been known for its judicious curtailment of outdoor relief, which in twenty years has resulted in a reduction of outdoor paupers from 1,707 to 38, and a decrease of its half-yearly expenditure in out-relief from 3,064*l.* to less than 200*l.*

As the object of this paper is simply to record the attempts to dispose of sewage in villages, and in no way to describe the various systems of drainage employed, it will be quite unneces-

sary to go through the different parishes of the Brixworth Union in detail, or to minutely explain the construction of their sewers. Sir Robert Rawlinson was consulted upon the different plans, and all the parishes were sewered upon the sound engineering principles which he has so zealously recommended as chief engineer of the Local Government Board. Where it was possible, the closets of all the houses and cottages in the village were connected with the sewers, which are all constructed of glazed-earthen-socketed pipes, varying from 6 to 12 inches in diameter. The old drains, channels, and ditches are still used for carrying off the land drainage and surface-water from the roads. Very few accidents of any kind have happened to the sewers since their construction. Of three blocks, one was caused by cocoanut shell, and another by a turnip; and if the presence of these articles in the sewers might possibly be due to accidental causes, the insertion of a horse-collar must certainly be classed among malicious and wilful obstructions. Beyond removing these impediments, very few repairs or alterations have been necessary, which shows how thoroughly well the sewerage-works have been executed in the Union.

In every instance the sewage flows, by its own gravity, to a deeply-drained plot of land, surrounded by a clay bank, to prevent any overflow. These filter-beds are generally planted with osiers, but some with ash-poles, which are more easily kept clean, and, since the decline in the value of osiers, may yield a better return. On the other hand, osiers are preferable to ash-poles, for the hoeing and cleaning they require stirs the surface, and gives better filtration. Moreover, the osier is a grosser feeder, having a better appetite for filth, and converting more of it into vegetable growth. The annual cuttings expose the surface to the purifying influences of the sun, light, and air. If the filter-bed is of clay, some cultivation is very important, as without it the land is liable to crack, and the flocculent matter to go straight down into the drains. But the land under ash-poles can be dug once a year, and, if very stiff soil, might with advantage be covered with some friable soil, road-scrappings, &c.

The sewage runs down a main carrier, and is diverted by the superintendent into the small channels which divide the beds, the only escape for the effluent water being through the deeply-laid under-drains. On the Brixworth osier beds, the quantity of solid matter deposited by the sewage has so raised the land that the top soil must be soon carted away. This deposit, although full of nettles and weeds, should be a capital dressing for grass-land, for it really contains as much goodness as the dried sludge which at some sewage-works is converted into

artificial manure, and has been sold to ignorant and confiding farmers at 3*l.* 10*s.* per ton. The sewers are flushed out once a month, the Sanitary Authority providing a water-cart, and paying 6*s.* for man and horse when required. The whole of the sewers are under the management of Mr. W. Gilby, for many years the indefatigable Inspector of Nuisances of the Brixworth Union.

Considerable opposition was originally raised to some of these drainage schemes, that to the Brixworth sewerage costing the parish 128*l.* Some dissatisfaction is also caused by the manner in which the outlay for these great sanitary improvements is charged; and Mr. Albert Pell, in the Annual Report of the Brixworth Union in 1879, somewhat justifies this complaint, for he says: "The law as it stands is regarded as inequitable, as it appears an improved value is conferred on one description of real property at the expense of another." This is quite true, but is a mere trifle when compared with the injustice of allowing realised wealth to escape its share of local burdens, which fall so oppressively upon the depreciated agricultural land of this country.

The sanitary necessity for sewerage some of the parishes in the Brixworth Union was stated in a report from Dr. Thorne Thorne, who, in 1874, wrote that "the deaths from fever per 1,000 were, in the Standard Rural Districts, 48; in Northamptonshire, 80; and in this particular Union, 112." Dr. Thorne contended that "the mischief was traceable to cesspools and old highway-drains in porous soils allowing soakage and pollution of drinking-water, which is mostly derived from shallow springs." The water-tight system of sewers, which has been carried out in so many parishes, has, happily, been the means of almost banishing fever from those localities. Less sickness has been followed by a diminished poor's rate; so the sewerage of the Union may be said to be, not only a sanitary, but a financial, success.

The marked improvement in the health of this Union, comparing the ten years previous to any sewage scheme being adopted, with the ten years which followed its adoption, is thus described by Dr. Parsons in a later report to the Local Government Board. The information from the Registrar-General's annual and quarterly reports, "shows a gratifying decline of mortality amounting on their present population to an annual saving of about twenty lives, or, reckoning five severe cases of illness to one death, of one hundred severe illnesses with their attendant suffering and expense." With such testimony, how can any one doubt that the money laid out on these village sewers, has been well, wisely, and profitably spent?

The following table shows the cost of draining those parishes of the Brixworth Union where a complete system of sewers has been adopted; there are other villages which have been only partially sewered:—

Name of parish in the Brixworth Union	Population in 1881	Date of Works	Cost, including land	Extent of land irrigated	How cropped
Brampton Chapel	233	1880-1	£ 407	Half an acre	Osiers
Brixworth . . .	1,183	1876-8	822	One acre	Osiers
Harlestone . . .	569	1878	750	One acre	Ash-poles
Moulton . . .	1,483	1874-8	980	One acre	Osiers
Spralton . . .	817	1886	810	One acre	Ash-poles
Walgrave . . .	603	1874-8	673	One acre	Osiers

The sewerage of *Whissendine*, a village of Rutland containing 734 inhabitants, was completed last year, at the following cost:—

Sewering Whissendine village (including 140 <i>l.</i> for outfall and osier bed—1 acre)	£ 849
Engineer and clerk of works	126
Compensation to occupiers of land crossed by sewers to outfall, about	25
Total	£1,000

The inspection was made after a very heavy rainfall, when the Whissendine Brook, celebrated in many hunting annals, was overflowing its banks. The flood had just reached the lower part of the freshly-planted acre of osiers, upon which the sewage is delivered, but none of it escaped unfiltered. The fall of the main sewer from the village to the filter-bed is 1 in 400, and there are two flushing-tanks from spring drains. The Inspector of Nuisances of the Oakham Union is the only officer employed, but a village superintendent would appear almost a necessity.

Ashwell, also in Rutland, with a population of about 200, has been lately sewered. The first contract was for 352*l.*; but an extension of the chief sewer, and a larger filter-bed, cost another 140*l.* The main drain is easily flushed, from the brook which flows through this village, by means of a sluice-door; but there is only one filter-bed, its three compartments being filled with stone and gravel—so that even the clarification of the sewage is by no means perfect.

The town of *East Dereham*, Norfolk, contains about 6,000 inhabitants, and is well and cheaply sewered. The sewage flows by its gravity into a valley, and empties itself, without any preparation beyond a small settling-tank and grating, upon

4 acres of osier beds. These 4 acres filter all this raw sewage, and it is only after very heavy rains and thunderstorms that there is any overflow from the sewers into the brook, and that is mostly surface-water. The Chairman of the Board—a gentleman of great practical experience, who devotes his leisure to the zealous performance of the honorary duties of his office—considers that 6 acres of osiers would be ample to purify the largest volume of sewage for many years, even if the town should considerably increase; and he is satisfied that, with the exception above stated, the sewage-effluent is now perfectly clear and innocuous. The common osier is being discarded for the “brown Holland,” a variety which is much tougher, and sells better than the ordinary sallow. No produce has come down in price like osiers. A few years ago, 10*l.*, and even 15*l.*, per acre was made of one year’s growth. At Dereham, the two years’ crop of 1887–8 off 4 acres realised only 12*l.*; but this year’s growth has fetched 10*l.*, which is still a poor price. A few mangel are grown every year on the margin of the stream. The services of one man are employed for about three-fourths of his time to direct and control the flow of sewage, and some extra help is needed to clear out the channels and keep down the weeds and rubbish before the osiers grow freely in the spring. The whole of the land was drained, 3 feet deep, before the osiers were planted, and the drains work well, and have never been any trouble from the growth of roots during the eight years the beds have been at work.

The cost of the sewerage of Dereham in 1881 was as follows:—

	£	s.	d.
Contract for pipes, manholes, excavating and laying	3,454	14	3
4a. 1r. 2p. land for irrigation, surveyors, and arbitration	794	12	1
Draining and preparing the ground	473	10	8
Compensations for disturbance	88	7	10
Engineer’s commission	100	0	0
	£4,911	4	10

In addition to this, there were expenses exceeding the amount authorised to be borrowed by about 300*l.*, which cannot now be readily ascertained, and which were subsequently paid out of the rates. Excepting a few of the outlying portions, the whole of the town was sewered, to the extent of about two hundred acres. The sewers are all of glazed earthen pipes, varying in size from 9 to 18 inches, in gradient from 1 in 600 to 1 in 17, and in depth from 6 to 23 feet; and the total length is nearly four

miles. There is a manhole, or lamphole, at every intersection or curve, the pipes being laid in a true line between these for examination. These holes were all (67) originally left open for ventilation at the road level, but had to be closed; and in 1887, two sewer-gas destructors were put up, and several simple ventilating-pipes inserted at ends of the long sewers, or important bends, and there has been no trouble since. At the end of every sewer, provision is made for flushing by a 3-inch sluice-valve from the adjoining water-main, as the rain-water was kept out of the sewers as far as practicable. It may not be too much to say, that the sewage-scheme of East Dereham might—for its economy, utility, and success—compare favourably with any small town in Great Britain.

The populous village of *Castleacre* stands upon the brow of what is regarded in Norfolk as a high hill. The road down the main street is very steep, and it was difficult to keep the highway in repair, by reason of the rush of surface-water; while the practice of throwing house-slops into the road-gutters was fearfully offensive. To remedy these two evils, a paved channel has been formed for the surface-water, and a sewer made down the street, which receives all the house-slops. There are no water-closets in the village, and the sewer empties itself into a hole in a meadow. No effort is made to utilise the sewage—which cannot be of much manurial value—and it soaks into the surrounding soil, promoting a vigorous growth of nettles. Once a year the hole is emptied of its solids by means of a chain-pump. The sewer, as occasion requires, is flushed by water-cart, the three principal farmers in turn supplying a horse gratis. Since a lofty ventilating-shaft has been inserted, there has been much less unpleasant odour from the sewer. A parish inspector has been appointed, at a salary of 10*l.* a year, whose duties are to superintend and cleanse the sewer and all gulleys and traps, and the construction of any branch drains which have to be connected with the sewer. The total expenditure amounted to 280*l.* The cost of engineering, which presented no difficulties whatever, was 50*l.*—a marked contrast to the engineer's commission of 100*l.* at Dereham, where the sewage-scheme cost over 5,000*l.* The clerk of the works and the Local Government Board inquiry cost 30*l.*, making up 80*l.* for outside expenses—a pretty heavy percentage upon a total outlay of 280*l.* And it is possible that this engineering skill, which rigidly excludes the surface- and roof-water from the sewer, has been misapplied in this village. There is ample capacity for the largest volume of rain-water, and as no use is made of the sewage, its dilution can do no harm; while every shower of rain

would help to cleanse the short sewer, and render the necessity of flushing less frequent. The flushing apparatus has a basin, or reservoir, which does not tip until it is full. It has hitherto worked fairly well, but, if not constantly attended to, it may soon get out of order and cease to act. These contrivances cannot be too simple.

A cheap and apparently successful example of village sewage-irrigation is furnished at *Kebworth Beauchamp*. The cost of the sewage-works and settling-tanks was only 120*l.*, and the sewage irrigates 5 acres of grass-land, held on a twenty-one years' lease at 30*l.*, and is sub-let to a yearly tenant for 24*l.* 10*s.* No complaint has been made of the sewage being at all offensive since the settling-tanks were added, three or four years ago.

The inclusion of a town of the importance of *Henley-on-Thames* is hardly within the scope of this paper; but hearing that a new and greatly improved system of sewage was just started there, it seemed advisable to inspect it. The engineering feat of taking the sewage to the lowest possible point, and then pumping it to the summit of the nearest hill, has been successfully accomplished at Henley. Shone's compressed-air system is worked by a 27 horse-power steam engine, and the sewage is lifted 120 feet, and delivered into settling-tanks. It then irrigates about 4 acres of land, 1½ acres of which are planted with osiers, and the rest devoted to the growth of mangel and Italian rye-grass. There is no outfall, the water percolating through the deep strata of the Upper Chalk, and being seen no more. But the land is already supposed to become clogged, and the sludge is a nuisance; so the Town Council have decided to adopt the treatment of Messrs. Jagger & Turley, of Leeds, that burns the house-refuse to a carbon, which is to be employed in the deodorisation of the sewage, and for the more rapid deposition of the sludge on the settling-tanks. Then the effluent passes through a filter of carbon and cinders, by which time the sewage becomes "so clear and odourless," and is of such a "high standard of purity, that it might be turned into any river." But it is to be further improved—if that is possible—by irrigating the 4 acres of land; so the sewage of Henley (if it ever does reach the Thames after its long subterranean passage) ought certainly to be the purest effluent in the world.

Having now recorded a few successful examples of the disposal of sewage in some towns and villages, it is hardly necessary to particularise those Sanitary Authorities where common sewage-farming is practised on a small scale. Italian rye-grass is the only crop to which raw sewage can be directly applied with

any certainty of success; and the introduction of silos has made the growth and disposal of such herbage comparatively easy. The rapid growth of roots and vegetables can be enhanced by sewage-irrigation; but the sewage had better fertilise the ground during the winter than be applied direct to the plants, except in dry seasons. To grain of all kinds, the flow of sewage invariably does much more harm than good. In the rural districts, there ought seldom to be any great difficulty in obtaining land for sewage-irrigation, though many owners, as well as their tenants, have a strong objection to parting with an acre or two for this purpose.

There are serious impediments in populous urban localities to sewage-irrigation, the securing of suitable land at a moderate cost being generally the crowning difficulty. In these localities, the different modes for precipitating, deodorising, and clarifying the sewage, by the aid of settling-tanks, chemicals, &c., may be the only means for preparing the sewage-effluent for its reception into the nearest river or stream. But, the less that is done with sewage in purely rural districts before it is applied to the land, the better. It may be well to take out the floating rubbish and the heavier solids by means of a small tank and grating; but even this is not necessary for a village filter-bed where osiers or ash-poles are the crop grown. It is necessary to keep the sewage moving, allowing none to stagnate for any length of time—and then there is little effluvia from the roughest irrigation. When once a proper system of sewers has been approved in a rural district by the Local Government Board, the employment of skilled engineers with elaborate plans, sections, and clever inventions, generally leads to a heavy outlay, without much corresponding benefit. A competent, practical surveyor, who can take levels, lay a drain, and make good a roadway with a strong gang of skilled drainers, will be all that is required for sewerage most villages, and even some small towns.

CLARE SEWELL READ.

OBSERVATIONS AND EXPERIMENTS ON SOME ENGLISH PASTURES.

THE results of Dr. Fream's investigations into the composition of the herbage of old grass lands, as recorded in the number of the Journal for October 1888 (Vol. XXIV., 2nd Series), were so important that the Council of the Society, at the recommendation of the Seeds and Plant Diseases Committee, resolved

to make further observations on some of these pastures. The method adopted by Dr. Fream was to obtain a turf 2 feet long by 1 foot wide and 9 inches deep from the best grass lands of different districts, selected by local men who were believed to know the best pastures. These turfs were planted in the Botanical Garden of the College of Agriculture at Downton, and were carefully observed by Dr. Fream during their growth; and in the course of the month of July the turfs were successively cut, the elements were separated into their various species, and then the whole of the plants of each species were weighed in their green state.

The Committee selected for further observation those pastures in England in which Dr. Fream had determined the presence among the grasses of more than 75 per cent. of rye-grass. The following twelve localities were accordingly fixed upon. The pastures are given in the order and with the numbers of Dr. Fream's paper, with the percentage he records for the rye-grass among the gramineous herbage:

LOCALITIES SELECTED FOR FURTHER OBSERVATION.

Dr. Fream's No.	No. in this paper	Locality	Percentage of rye-grass in gramineous herbage
2	10	Tenterden, Kent	80
3	3	Mangerton, Dorset	76
4	7	Little Marston, Dorset	77
5	9	Wiveliscombe, Somerset	82
7	12	North Curry, Somerset	90
10	13	Ashburton, Devon	82
11	2	Berkeley, Gloucestershire	83
19	5	Aylesbury, Bucks	80
20	14	Old Court, Hereford	100
21	1	Corsley Meadows, Wilts	88
23	11	St. Alger's, Somerset	86
24	6	Romney Marsh, Kent	97

In addition to these it was decided to make similar observations on a pasture at Market Harborough and another at King's Lynn.

The method proposed was, first to obtain permission from the various gentlemen who had provided the turfs to enclose a portion of the field near to the place where the turfs had been taken. This was cordially given, and early in the season of 1889 eight large hurdles were erected in each of the fields, enclosing about sixteen square yards; and within these, four smaller game hurdles were erected, enclosing a plot four yards square. In the course of June and July, I visited all the localities, with the view of seeing the nature of the herbage in the fields in which the plots were enclosed, and of determining

how far the herbage of the enclosed plots represented the whole of the pasture of the field. The enclosures, I found, were in every case alongside of the places from which the turfs had been taken. They fairly represented the general character of the pasture, though in some cases important elements in the pasture were not found in the enclosure.

The state of the plants at the time of my inspection enabled me to determine the time when the plots should be cut, and in the course of July and the beginning of August the herbage of the square yard in the centre of the enclosure was cut and forwarded to me. The different elements of the herbage were then separated into their various species.

Dr. Fream weighed the plants immediately on completing the separation of each turf, and while they were yet green. As the plants I examined were cut in the various localities, were differently packed, and took different lengths of time in reaching me—and moreover as the time occupied in separating the different species of the various plots varied in proportion to the simplicity or complexity of their composition, or the close resemblance of some of the species—it appeared to me that the better way to get a common standard for the various plants was to dry them all carefully and equally, and then weigh them. The relative proportions of the different elements of the pastures in the following tables are based, therefore, on their *hay* weights.

The pastures examined may be grouped into : I. Rich alluvial meadows ; II. Old grass pastures ; and, III. Small home fields.

I. RICH ALLUVIAL MEADOWS.

1. *Corsley Meadows, Longleat, Wilts : Mr. H. P. Jones.*—I visited these meadows on June 17 and was conducted over them by Mr. Moorson. There was a heavy pasture, the predominant plant being Yorkshire fog, then florin, sweet vernal, dogstail and rye-grass. Hard fescue formed the predominant undergrass. There were a good many plants of tufted hair-grass (*Aira caespitosa*, Linn.), and here and there a plant of cocksfoot, but not contributing much to the general pasture. There were a good many buttercups and some sorrel. The field consisted of thirty-nine acres, and had fattened thirty Scotch animals.

The plot was cut on July 26 under the direction of Mr. H. Fry, and the composition is expressed in the following table. The first column gives the proportion of all the herbage in the plot. The second column gives the relative proportion of the various grasses in the gramineous vegetation, for comparison with Dr. Fream's similar analysis, which is given in the third column :—

	The enclosed plot The turf	
	Analysis of all the herbage	Analysis of the gramineous herbage
		Dr. Fream
Florin, <i>Agrostis alba</i>	36	37 7
Yorkshire fog, <i>Holcus lanatus</i>	24	25 4 ¹
Hard fescue, <i>Festuca duriuscula</i>	20	20 1
Sweet vernal, <i>Anthoxanthum odoratum</i>	10	10
Dogstail, <i>Cynosurus cristatus</i>	7	7
Rye-grass, <i>Lolium perenne</i>	1	1 88
Quaking-grass, <i>Brixa media</i> —one plant		
Weeds	2	

Dr. Fream found 3 per cent. of leguminous plants and 2 per cent. of buttercup. The 2 per cent. of weeds I found consisted of buttercup (*Ranunculus acris*), mouse-ear chickweed (*Cerastium triviale*), bugle (*Ajuga reptans*), sorrel (*Rumex Acetosa*).

2. *Berkeley Castle, Gloucestershire: Lord Fitzhardinge.*—I visited this pasture on July 22, and was taken over the field by Mr. James Peter. The meadow is always under water during the winter. It is a plain a little above the level of the water. The soil is a rich alluvial loam. The nature of the herbage is necessarily modified by the winter submergence and the rich, damp, alluvial soil. The chief grasses were florin, Yorkshire fog, and rye-grass. There was a little timothy and cocksfoot, and a few plants of soft brome-grass. The weeds were buttercups and dandelions. It had been hayed and yielded a crop of over two tons to the acre.

The crop was cut on July 27, and the analysis of the herbage gave the following results:—

	The enclosed plot The turf	
	Analysis of all the herbage	Analysis of the gramineous herbage
		Dr. Fream
Rye-grass, <i>Lolium perenne</i>	34	36 83
Yorkshire fog, <i>Holcus lanatus</i>	25	26 2 ²
Florin, <i>Agrostis alba</i> with <i>A. vulgaris</i> ³	36	38 15
Timothy, <i>Phleum pratense</i>	2	
Dogstail, <i>Cynosurus cristatus</i>		
Cocksfoot, <i>Dactylis glomerata</i>		
Buttercup, <i>Ranunculus acris</i>	3	

Dr. Fream found 38 per cent. of white clover—which formed a rich bottom-growth in his turf—and 5 per cent. of miscellaneous herbage, consisting of buttercup and mouse-ear chickweed.

¹ With *Poa trivialis*, *Alopecurus pratensis*, *Cynosurus cristatus*.

² With *Poa trivialis* and *Dactylis glomerata*.

³ I have here united the produce of these two plants, as they were not separated by Dr. Fream.

3. *Mangerton, between Powerscourt and Bridport, Dorset: Mr. C. F. L. Sanctuary.*—I visited the estate of Mr. Sanctuary on July 18. The field is a rich pasture, on a dark loam soil, in the bottom of a narrow valley. There were a good many weeds, and the field was yellow with buttercup (*Ranunculus acris*), but Mr. Sanctuary informed me that when the cows were put on the pasture they cleared off the buttercups in a fortnight. The other weeds consisted of a considerable quantity of rib-grass, yarrow, bugle, knapweed, and sorrel. There was some red clover and less white clover. The predominant grasses were florin, yellow oat-grass, Yorkshire fog, dogstail, rye-grass, cocksfoot, and sweet vernal.

The plot was cut on August 5, and the analysis gave the following results:—

	Analysis of all the herbage	The enclosed plot The turf	
		Analysis of the gramineous herbage	Dr. Fream
Yellow oat-grass, <i>Avena flavescens</i>	17	31	3 ¹
Florin, <i>Agrostis alba</i>	12	22	
Cocksfoot, <i>Dactylis glomerata</i>	11	20	13
Yorkshire fog, <i>Holcus lanatus</i>	8	15	3
Dogstail, <i>Cynosurus cristatus</i>	3	6	5
Rye-grass, <i>Lolium perenne</i>	2	4	76
Sweet vernal, <i>Anthoxanthum odoratum</i>	$\frac{1}{2}$	1	
Meadow fescue, <i>Festuca pratensis</i>	$\frac{1}{2}$	1	
Ribgrass, <i>Plantago lanceolata</i>	22		
Bugle, <i>Ajuga reptans</i>	9		
Buttercup, <i>Ranunculus acris</i>	8		
Yarrow, <i>Achillea Millefolium</i>	4		
Knapweed, <i>Centaurea nigra</i>	3		

Besides the grasses, Dr. Fream found in his turf 5 per cent. of leguminous plants, composed in about equal parts of white and red clover. These clovers I observed in the field, but neither of them were present in the herbage of the plot. Dr. Fream had 15 per cent. of miscellaneous herbage in his turf, consisting of buttercup, dandelion, rib-grass, speedwell and daisy, their relative importance being in the order given. I found 46 per cent. of miscellaneous herbage, consisting of the plants recorded in the table, and in the proportions given there.

4. *King's Lynn, Norfolk: Mr. F. I. Cooke.*—The field on Mr. Young's farm was portion of an extensive alluvial deposit, having a heavy loam soil. I inspected the field on July 2, and found the predominant grasses were meadow barley-grass, Yorkshire fog, dogstail, timothy, and smooth-stalked meadow-grass; in less quantity there were present florin, rye-grass,

¹ With *Poa trivialis* and *Festuca ovina*.

yellow oat-grass and foxtail. There was a little clover in the pasture. A considerable number of daisies and thistles were scattered over the field. The places where the stock had dunged and the herbage had been left were composed chiefly of Yorkshire fog, with some dogstail, foxtail, and a plant or two of cocksfoot, meadow barley-grass and soft brome-grass.

The plot was cut in the end of July, and showed the following composition on analysis :—

	Per cent.		Per cent.
Meadow barley-grass, <i>Hordeum pratense</i>	31	Rye-grass, <i>Lolium perenne</i>	7
Yorkshire fog, <i>Holcus lanatus</i>	26	Dogstail, <i>Cynosurus cristatus</i>	5
Yellow oat-grass, <i>Avena flavescens</i>	11	Foxtail, <i>Alopecurus pratensis</i>	2
Fiorin, <i>Agrostis alba</i>	8	Smooth-stalked meadow-grass, <i>Poa pratensis</i>	1
Timothy, <i>Phleum pratense</i>	7	Red clover, <i>Trifolium pratense</i>	2

This is not one of the pastures from which Dr. Fream received a turf.

II. OLD GRASS PASTURES.

5. *Aylesbury, Bucks.*—This is a field of sixty acres, used for fattening stock. The soil is a rich loam. I examined it on July 1, and estimated that from 35 to 40 per cent. of the pasture consisted of white clover, and that the grasses were dogstail, rye-grass, rough-stalked meadow-grass, meadow barley-grass, and a little foxtail. A considerable quantity of buttercup was scattered over the field. The whole was closely eaten down, only here and there some of the dogstail had run to seed. In a lower, damper, and richer part of the field there were patches of luxuriant cocksfoot, dogstail, meadow barley-grass, and rye-grass, with some plants of buttercup which had run to seed. The portion enclosed was on the higher part of the field, and fairly represented the general pasture. The plot was cut on July 26, and was found to consist of the following plants :—

	The enclosed plot The turf	
	Analysis of all the herbage	Analysis of the graminaceous herbage
		Dr. Fream
Dogstail, <i>Cynosurus cristatus</i>	30	43
Rye-grass, <i>Lolium perenne</i>	30	43
Meadow barley-grass, <i>Hordeum pratense</i>	7	10
Rough-stalked meadow-grass, <i>Poa trivialis</i>	1	2
Bent grass, <i>Agrostis vulgaris</i>	1	2
Timothy, <i>Phleum pratense</i>		3
White clover, <i>Trifolium repens</i>	30	15
Buttercup, <i>Ranunculus acris</i>	1	

¹ With *Alopecurus pratensis*, *Holcus lanatus*, and *Poa trivialis*.

In addition to the grasses Dr. Fream found in his turf 5 per cent. of white clover and a trace of buttercup.

6. *New Romney, Kent: Mr. A. Hutchison.*—I inspected this pasture on June 8. It was a small field by the side of the road near the town of New Romney, and is on a slightly elevated piece of ground, with a sandy loam for a soil, resting on a sandy subsoil: but it is not from the famous Romney Marsh. The field was pastured by mixed stock. On account of the high price of lean stock, and the low price of fat stock, Mr. Hutchison had not added to his stock, so that there was not sufficient in the field to consume the pasture, and it was, consequently, imperfectly eaten. It was full of buttercup (*Ranunculus bulbosus*), and contained a good many daisies and some sorrel. More than half of the pasture was untouched by the stock, and the parts neglected were those in which the buttercup was flourishing. The chief grasses in the field were rough-stalked meadow-grass and dogstail, with a good deal of cocksfoot and yellow oat-grass. When I visited the field in the beginning of June the rye-grass, which proved afterwards to be the most abundant grass in the pasture, was considerably behind the other grasses: the foliage could be detected when the other grasses were pressed aside, but only a few flowering heads were showing themselves. The field in which the plot was enclosed, and from which a portion of Dr. Fream's turf was taken, had similar herbage to the neighbouring fields which I examined, and from which the other portions of the turf were obtained. The enclosed plot was fairly representative of the herbage of these fields. It was cut on July 15, and the analysis showed the following results:—

	The enclosed plot The turf	
	Analysis of all the herbage	Analysis of the graminaceous herbage
		Dr. Fream
Rye-grass, <i>Lolium perenne</i>	59	66 97
Dogstail, <i>Cynosurus cristatus</i>	13	14 a trace
Yorkshire fog, <i>Holcus lanatus</i>	0	7
Rough-stalked meadow-grass, <i>Poa trivialis</i>	5	6 a trace
Meadow barley-grass, <i>Hordeum pratense</i>	4	4
Yellow oat-grass, <i>Avena flavescens</i>	2	2 3 ¹
Cocksfoot, <i>Dactylis glomerata</i>	1	1
Yellow suckling clover, <i>Trifolium minus</i>	6	
White clover, <i>Trifolium repens</i>	4	

The rye-grass, so inconspicuous in the separated plot, in the beginning of June, had now become the chief ingredient, while the dogstail and meadow-grass, the leading grasses at the

¹ With *Agrostis*.

earlier date, were relatively unimportant at the time of cutting. The enclosed portion was free from buttercup, though it was very abundant in the field. I detected no plants of either foxtail or timothy in the fields I examined, and though I found specimens of fiorin by the roadsides I did not observe it in the fields.

Dr. Fream found in his turf 21 per cent. of white clover, but no weeds.

7. *Little Marston, Sherborne, Dorset: Mr. J. P. Oatway.*—I visited this pasture on July 17, and was shown over the field by Mr. Oatway, who farms it. The soil was a stiff clay. The field had been hayed, and the aftermath was fed off, the stock being supplied with some corn in addition. There was a good bottom of white clover, which made little show, and some mixture of red clover, which was more visible. A good deal of buttercup was present. The predominant grasses were Yorkshire fog and meadow barley-grass, then came dogstail and sweet vernal, with still less of fiorin and yellow oat-grass. I observed not a few plants of black bent (*Alopecurus agrestis*) scattered throughout the field.

The plot was cut in the end of July, and was found to be composed of the following plants:—

	The enclosed plot The turf	
	Analysis of all the herbage	Analysis of the gramineous herbage
		Dr. Fream
Yorkshire fog, <i>Holcus lanatus</i>	30	34 9
Meadow barley-grass, <i>Hordeum pratense</i>	23	26
Sweet vernal, <i>Anthoxanthum odoratum</i>	20	22
Dogstail, <i>Cynosurus cristatus</i>	14	16 2
Fiorin, <i>Agrostis alba</i>	2	2 8
Rye-grass, <i>Lolium perenne</i>		77
Foxtail, <i>Alopecurus pratensis</i>		3
Timothy, <i>Phleum pratense</i>		1
Red clover, <i>Trifolium pratense</i>	7	
Buttercup, <i>Ranunculus acris</i>	4	

Dr. Fream found only traces of white clover, and of mouse-ear chickweed and buttercup; the herbage in his turf was practically all grass.

8. *Market Harborough: Mr. E. K. Fisher.*—I visited the field belonging to Mr. Fisher on July 1. It was being pastured by sheep. The herbage consisted chiefly of rye-grass, with considerable quantities of meadow barley-grass and dogstail, and lesser amount of yellow oat-grass, with a very few scattered plants of cocksfoot, Yorkshire fog, rough-stalked meadow-grass, and fiorin. There appeared to be about 30 per cent. of

white clover, though the proportion was obviously much smaller in the plot. There were a good many buttercups scattered over the field.

The plot was cut on August 5, and the analysis showed that it consisted of the following plants:—

	Per cent.		Per cent.
Rye-grass, <i>Lolium perenne</i>	31	Timothy, <i>Phleum pratense</i>	2
Meadow barley-grass, <i>Hordeum pratense</i>	31	Yorkshire fog, <i>Holcus lanatus</i>	1
Dogstail, <i>Cynosurus cristatus</i>	14	Cocksfoot, <i>Dactylis glomerata</i>	$\frac{1}{2}$
Yellow oat-grass, <i>Avena flavescens</i>	6	Rough-stalked meadow-grass, <i>Poa trivialis</i>	$\frac{1}{2}$
Fiorin, <i>Agrostis alba</i>	5	White clover, <i>Trifolium repens</i>	4
		Buttercup, <i>Ranunculus acris</i>	5

Dr. Fream did not have a turf from this field.

9. *Wiveliscombe, Somerset: Mr. W. Hancock.*—I inspected this pasture on July 18. Mr. Hancock took me over the field, and several other pastures on his farm. The soil of the field in which the plot was enclosed was a red, clayey loam. The field had a southern aspect. Mr. Hancock had observed that fields on his farm with a northern aspect yielded much less food than those with a southern aspect. The predominant grass in the field was fiorin; then followed rye-grass and Yorkshire fog, with much smaller quantities of rough-stalked meadow-grass, sweet vernal, dogstail, and cocksfoot. There was a little white clover; and some ribgrass. The pasture fattened bullocks, but they had to be finished in the stalls.

The plot was cut in the end of July, and the analysis showed the following results:—

		The enclosed plot The turf	
		Analysis of all the herbage	Analysis of the gramineous herbage
			Dr. Fream
Fiorin, <i>Agrostis alba</i>	40	52	10
Rye-grass, <i>Lolium perenne</i>	17	18	82
Yorkshire fog, <i>Holcus lanatus</i>	14	15	5
Cocksfoot, <i>Dactylis glomerata</i>	4	4	
Dogstail, <i>Cynosurus cristatus</i>	9	9	
Rough-stalked meadow-grass, <i>Poa trivialis</i>	1	1	3
Sweet vernal, <i>Anthoxanthum odoratum</i>	1	1	
White clover, <i>Trifolium repens</i>	2		
Red clover, <i>Trifolium pratense</i>	1		
Ribgrass, <i>Plantago lanceolata</i>	1		
Yarrow, <i>Achillea Millefolium</i>	1		
Hawkbit, <i>Leontodon hispidus</i>			
Mouse-ear chickweed, <i>Cerastium triviale</i>			

Dr. Fream found that the miscellaneous herbage composed 29 per cent. of the plants on his turf, and was almost entirely made up of *Leontodon* sp.

10. *Goorshill, Tenterden, Kent: Mr. George Button.*—I visited this field, on the farm of Mrs. Button, on June 19. It was in hay. The soil was a stiff, yellowish clay, full of roots. The herbage of the field consisted mainly of dogstail, with a considerable show of Yorkshire fog; then the following grasses, which I give in the order of their abundance: Fiorin, rye-grass, yellow oat-grass, foxtail, sweet vernal, and smooth-stalked meadow-grass. There was a good deal of yellow suckling clover, and some red clover. The weeds consisted of sorrel, buttercup, and daisy.

The pastures all along the eight miles' drive from Headcorn (the station on the South-Eastern Railway) was very light, and appeared at this time to consist mainly of dogstail, Yorkshire fog, rye-grass, and fiorin. A field lately laid down on Mrs. Button's farm contained a considerable quantity of cocksfoot and foxtail—grasses most rare in the district. Another field, which had lately been allowed to lay itself down, had nothing but couch-grass (*Triticum repens*) and weeds; and a third field, which had been allowed to lay itself down six years previously, was now covered with dogstail, Yorkshire fog, and fiorin.

The enclosed plot was cut on July 12, and consisted of the following plants:—

	The enclosed plot The turf	
	Analysis of all the herbage	Analysis of the gramineous herbage
		Dr. Fream
Dogstail, <i>Cynosurus cristatus</i>	20	23
Fiorin, <i>Agrostis alba</i>	28	31
Meadow barley-grass, <i>Hordeum pratense</i>	16	18
Yorkshire fog, <i>Holcus lanatus</i>	11	12
Foxtail, <i>Alopecurus pratensis</i>	1	1
Rye-grass, <i>Lolium perenne</i>	11	12
Yellow oat-grass, <i>Avena flavescens</i>	3	3
Timothy, <i>Phleum pratense</i>		
Red clover, <i>Trifolium pratense</i>	7	
Yellow suckling clover, <i>Trifolium minus</i>	$\frac{1}{2}$	
Weeds	$2\frac{1}{2}$	
		8
		5
		80
		7

The great quantity of fiorin is the most remarkable peculiarity of this pasture. The weeds consisted chiefly of buttercup (*Ranunculus acris*), mouse-ear chickweed (*Cerastium triviale*), bugle (*Ajuga reptans*), and sheep sorrel (*Rumex Acetosella*).

Dr. Fream found in his turf 8 per cent. of white clover, 2 per cent. of miscellaneous herbage—chiefly mouse-ear chickweed—but some buttercup as well.

11. *St. Alger's Farm, Woodlands, Somerset: Mr. H. P. Jones.*—

I visited this farm on July 17. The enclosed plot was in a small field. The pasture was full of weeds, but everything was eaten down very close by the cows, except the spots which were rejected because of their droppings. The great bulk of the pasture consisted of ribgrass, and with it was a considerable quantity of knapweed, ox-eye daisy, and black grass. There was a little clover—chiefly white clover, with some yellow suckling—and a little birdsfoot trefoil. The grasses were—dogstail in greatest abundance, then florin, Yorkshire fog, sweet vernal, and rye-grass.

The plot was cut on August 5, and on analysis proved to be composed of the following plants:—

	The enclosed plot The turf		
	Analysis of all the herbage	Analysis of the gramineous herbage	
		Dr. Fream	
Dogstail, <i>Cynosurus cristatus</i>	14	50	I
Sweet vernal, <i>Anthoxanthum odoratum</i>	4	14	
Florin, &c., <i>Agrostis alba</i> and <i>A. vulgaris</i>	8	28	6
Rye-grass, <i>Lolium perenne</i>	1	4	10
Meadow fescue, <i>Festuca pratensis</i>	$\frac{1}{2}$	2	11
Yorkshire fog, <i>Holcus lanatus</i>	$\frac{1}{2}$	2	15
Sheep's fescue, <i>Festuca ovina</i>			57
White clover, <i>Trifolium repens</i>	1		
Ribgrass, <i>Plantago lanceolata</i>	63		
Weeds	8		

Dr. Fream found 52 per cent. of his turf consisted of miscellaneous herbage, six-sevenths of which was ribgrass, the remainder being sorrel, selfheal (*Prunella vulgaris*), buttercup (*Ranunculus bulbosus*), and mouse-ear chickweed.

The turf which I have here contrasted with the pasture from St. Alger's Farm is that said to be from Webb's Farm (No. 22—Journal, October, 1888, page 435). A comparison of the results of my examination of the pasture from St. Alger's with Dr. Fream's 22 and 23, makes it obvious that by some accident these two turfs have got interchanged. This has led to the examination of a pasture in which Dr. Fream found only 10 per cent. of rye-grass, instead of one in which he makes the rye-grass amount to 86 per cent. of the grasses.

12. North Curry, Taunton, Somerset: Mr. C. R. Morris.—I inspected this field on July 18, and was shown over it by Mr. Morris, jun. The soil was a rich, friable loam. It had been hayed, yielding two tons of hay per acre. The predominant plants in the field were cocksfoot and yarrow. In addition, I found florin, rye-grass, yellow oat-grass, and Yorkshire fog.

There was some white clover and a few thistles scattered over the field. The hay had been cut five weeks previous to my visit, and a flock of sheep had been in the field for three days. They had everywhere cropped the cocksfoot, and where it was mixed with the yarrow the ground was very bare. Mr. Morris informed me that they fattened cattle for the butcher on this field, without any additional food. The herbage, he believed, was the natural growth of the land. No renovating seed had been sown, and the only manure applied to it was the droppings of the cattle which had been grazing on it.

The grass was cut on August 7, and showed the following results when analysed:—

	The enclosed plot The turf	
	Analysis of all the herbage	Analysis of the gramineous herbage
		Dr. Fream
Cocksfoot, <i>Dactylis glomerata</i>	56	70
Florin, <i>Agrostis alba</i>	8	10
Rye-grass, <i>Lolium perenne</i>	6	8 90
Yorkshire fog, <i>Holcus lanatus</i>	6	8
Dogtail, <i>Cynosurus cristatus</i>	3	4 2 ¹
Sheep's fescue, <i>Festuca ovina</i>		8
White clover, <i>Trifolium repens</i>	1	
Yarrow, <i>Achillea Millefolium</i>	20	

Dr. Fream found the turf from this pasture to consist of 11 per cent. of grasses, of which rye-grass formed 90 per cent., and no trace of cocksfoot was found; while the miscellaneous herbage formed 89 per cent. of the pasture, and was practically nothing but yarrow.

III. SMALL HOME FIELDS.

13. *Ashburton, Devon: Mr. Robert Tucker.*—I visited this pasture on July 19. It is a small field of about two acres by the side of Mr. Tucker's house, near the town of Ashburton. It is used for pasturing two cows. The principal grasses were rye-grass and timothy; there was some rough-stalked meadow-grass and florin, and a little Yorkshire fog. There was a little white clover, and less red clover. The miscellaneous herbage consisted of yarrow, ribgrass, buttercup, dandelion, and mouse-ear chickweed.

The plot was cut on July 27, and the analysis showed it to be composed of the following plants:—

¹ With *Anthoxanthum odoratum*, *Poa trivialis*, and *Avena flavescens*.

	The enclosed plot The turf	
	Analysis of all the herbage	Analysis of the gramineous herbage
		Dr. Fream
Timothy, <i>Phleum pratense</i>	36	38 13
Rye-grass, <i>Lolium perenne</i>	30	31 82
Rough-stalked meadow-grass, <i>Poa trivialis</i>	16	17
Fiorin, <i>Agrostis alba</i>	11	11 5
Yorkshire fog, <i>Holcus lanatus</i>	3	3
White clover, <i>Trifolium repens</i>	1	
Ribgrass, <i>Plantago lanceolata</i>	1	
Yarrow, <i>Achillea Millefolium</i>	1	
Mouse-ear chickweed, <i>Cerastium triviale</i>	$\frac{1}{2}$	
Buttercup, <i>Ranunculus acris</i>	$\frac{1}{2}$	

Dr. Fream had 6 per cent. of white clover on his turf, and his miscellaneous herbage consisted entirely of yarrow, except a single plant of dock.

14. *Old Court, Bredwardine, Herefordshire: Mr. Thomas Marston.*—I inspected this pasture on July 28. It was a small field adjoining the farm-house and steading, from which it was not separated by a fence of any kind. The road to the chief part of the farm passed through the field. The pasture consisted mainly of rye-grass, with some rough-stalked meadow-grass and fiorin. There was a good bottom of red clover throughout the field. The miscellaneous herbage consisted of yarrow, with some thistles, dock, and ribgrass.

The plot was cut early in August, and was found to consist of the following plants:—

	The enclosed plot The turf	
	Analysis of all the herbage	Analysis of the gramineous herbage
		Dr. Fream
Rye-grass, <i>Lolium perenne</i>	72	81 100
Rough-stalked meadow-grass, <i>Poa trivialis</i>	15	16
Fiorin, <i>Agrostis alba</i>	2	3
White clover, <i>Trifolium repens</i>	11	

Dr. Fream, besides the grass, which was entirely rye-grass, found on his turf 12 per cent. of white clover, and no weeds.

The remarkable differences in the composition of the pastures as determined by the turfs transported to Downton, and by the enclosed plots in the fields themselves, cannot be reconciled. The personal inspection of the pastures which I made in June and July last enabled me to compare the general character of the vegetation with what was growing in the enclosed plots; and though in some cases, which I have noted, there were impor-

tant elements in the pasture not to be found in the enclosure, on the whole, these plots fairly represented the general pasture. The results of this inspection, and the analysis of the herbage of the enclosed plots, convince me that small, transplanted turfs do not supply data to enable one to determine the composition of the pastures from which they are taken. Indeed, in the cases recorded in this paper the information they give is entirely misleading. Dr. Fream's data are accurate. He has, of course, given faithfully and accurately the different plants which grew on the turfs at Downton, and the various proportions of these plants. But these data have not been sufficient for the generalisations based on them as to the pastures from which they were obtained. The difficulty in obtaining a turf like those planted at Downton, that would represent the pasture, is to find within the space of two square feet specimens of the various plants, and in their relative proportions, which make up the pasture. In the middle of April, 1889, I visited some of the pastures in Romney Marsh. In a good field, which was well stocked, and, consequently, closely eaten down, I had two turfs the same size as those of Dr. Fream, growing quite close to each other, dug out, and transplanted where they could be observed. The farmer, and his foreman, who was so good as to dig up the turfs, considered each as an equally good specimen of the pasture. When the herbage of the turfs was cut in the autumn, and the elements separated, it was found that it consisted entirely of grasses, though the composition of the two turfs was very different. The following is the result of the analysis:—

TURF 1.		TURF 2.	
	Per cent.		Per cent.
Rye-grass, <i>Lolium perenne</i> . . .	51	Cocksfoot, <i>Dactylis glomerata</i> . .	87
Yellow oat-grass, <i>Avena flavesces</i>	32	Rye-grass, <i>Lolium perenne</i> . . .	8
Dogstail, <i>Cynosurus cristatus</i> . .	17	Yellow oat-grass, <i>Avena flavesces</i>	4
		Dogstail, <i>Cynosurus cristatus</i> . .	1

It is obvious that generalisations based on these two neighbouring and representative turfs would lead to very different conclusions. It is only by such an accident as would have happened in relation to the field in Romney Marsh if I had brought away only one of the turfs, that I can understand such a result as that shown by the Downton turf from North Curry (p. 106). The farmer at Romney Marsh would have considered either turf which he happened to fix on as representative, and sent it on to me for observation, had it been left to him to select the turf. At North Curry there was a considerable quantity of yarrow in the field, but of course it was not so equally distributed

that each square foot had its proper proportion; and there was also some rye-grass fairly distributed over the field, but yet not so that each plant was equally distant from all its neighbours. The turf that was sent to Dr. Fream contained 89 per cent. of yarrow and 11 per cent. of grasses, of which rye-grass formed nine-tenths. There was not a single plant of cocksfoot, which was the predominant grass throughout the field. Had it been to the right or to the left of the spot fixed upon, the turf could not have failed to show a large percentage of cocksfoot.

This North Curry pasture, tested by its feeding-qualities, was undoubtedly the best of the fourteen pastures that I inspected. But even here the replacement of the Yorkshire fog and florin, and, I will add, the rye-grass, by foxtail, meadow fescue, and rough-stalked meadow-grass, would unquestionably have improved it. Not one of the pastures I visited is so good as it easily might be made. The extraordinary abundance of such objectionable grasses as Yorkshire fog and meadow barley-grass in some of the pastures is surprising. A little care in preventing these and other inferior or worthless grasses from ripening their seed, and the sowing seeds of the better grasses without breaking the turf, accompanied with a little more liberal treatment in the way of manure, would very soon greatly improve all the pastures.

The composition of these pastures shows the fallacy of seeking in natural pastures the standard for laying down arable land in permanent grass. The adoption of such a standard is to reverse the whole practice and principles of modern farming. The farmer is, so to speak, ever at war with Nature. He is always trying to improve the breeds of his farm-stock and his crop-plants. A reversion to the wild type is a misfortune and a loss. A plant of Nature's sowing on his farm, where it should not be, is a weed to be eradicated. Are all the observations and experience that have been collecting since the days of Linnæus, and have been so much added to by Stillingfleet, Curtis, Sinclair, Moore, &c., and by many men still with us—are all these to be set aside?

In laying down land to pasture, as in sowing fields with wheat or any other crop, we must try to surpass Nature. We must bring together the most nutritious perennial plants which will supply palatable food for stock as far as possible all the year round, and we must exclude the weeds and worthless grasses which we have found too abundant in natural pastures. We must also consider the almost universal complaint of the deterioration, if not failure, of new pastures after the third or fourth year, and avoid short-lived grasses. Such pastures have

been laid down during the past ten or twelve years by Members of the Society in different parts of England and Scotland. These pastures have each year gone on improving; they have everywhere carried more stock than the old pastures on similar neighbouring lands; and their success has been, I believe, mainly due to the exclusion of rye-grass from the mixture of seeds employed in laying them down, and by the selection of what have been proved by experience to be the best permanent grasses and clovers.

WM. CARRUTHERS.

THE EVOLUTION OF THE HORSE.

FROM many points of view the Horse is one of the most interesting of animals. In utility to man it yields to no other. It was his domestic companion, friend, and servant before the dawn of history. It has accompanied him in his wanderings over almost every part of the surface of the earth, performing duties, both in peace and war, which no other animal could have done, and giving man facilities for the exercise of dominion over Nature which otherwise would have been impossible to him. The rôle of the ass, the ox, the camel, and the llama, in performing similar duties, has been of a limited and subsidiary nature compared to that of the horse. It is only in very recent times that the progress of mechanical invention has begun to supersede some of the uses for which the strength and the speed of the horse for many thousands of years have alone been available. How far this commencing disestablishment of the horse from its unique position, as the main agent by which man and his possessions have been carried and drawn all over the face of the earth, will go, it is difficult to say at present.

To the eye of the naturalist the horse presents other, and still higher, sources of interest. No better example can be found in the whole Animal Kingdom to illustrate certain great principles found acting universally in the construction of the bodies of all living beings, whether animals or plants. The structure of the horse in relation to that of allied animals, and to the actions it has to perform in the economy of Nature, may be most advantageously studied by every one who wishes to gain an insight into some of the fundamental principles of biology. In scarcely any other animal has *specialisation* of various parts—that is, modification from the general or average type to conform with the requirements of some special mode of existence—been carried to such an

extreme. In many organs, but especially in the limbs and teeth, we find the strongest evidence of two opposing principles striving against each other for the mastery in fashioning their form and structure. We find *heredity*, or adherence to a general type derived from ancestors, opposed by special modifications of, or deviations from, that type, and the latter generally getting the victory. The various specialisations, evidently in adaptations to purpose, will be thought by many to be the result of the survival, in the severe struggle for existence, of what is fittest for the purpose to which it is to be applied. This may or may not be the explanation, but the interest of the study of such an animal as the horse will be increased tenfold by the conviction that there is some true, and probably discoverable, causation for all its modifications of structure, however far we may yet be from the true explanation of the methods by which they have been brought about.

The anatomy and history of the horse are, moreover, often taken as a test case of the value of the theory of evolution, or the transmutation of animal forms one from another with the advance of time. The evidence in favour of or against the theory may in this case be derived from two distinct sources: I. The structure of existing horses; II. The past history of the race as revealed by fossil remains.

I. By far the most interesting portions of the organisation of existing horses from this point of view are the various rudimentary, and apparently useless, structures which occur in several parts of its body—structures which correspond with some which are fully developed in other animals, but which in the horse are so reduced in size or altered in character as to be of little, if any, use in its economy. In tracing the history and affinity of animals, rudimentary organs are looked upon by naturalists as far more important and interesting than highly-developed or functional parts. As Darwin says, they “may be compared with the letters of a word, still retained in the spelling, but become useless in the pronunciation, but which serve as a clue to its derivation.”¹ On the view of descent with modification, we may conclude that the existence of organs in a rudimentary, imperfect, or useless condition, or quite aborted, far from presenting a strange difficulty, as they assuredly do in the old doctrine of creation, might even have been anticipated in accordance with the views here explained.”

II. It is, however, to the ancestral history, as disclosed by palæontology, or the study of fossil remains, that we must look

¹ As, for example, the *b* in ‘debt’ and ‘doubt.’

for more direct evidence of the value of the theory; and we are in a better position to do this in the case of the horse than in that probably of any other animal, as it is one of the few whose history can be traced, through a tolerably complete chain of links, as far back as the earliest Tertiary age.¹ We must, however, not carry away the idea that the record is yet perfect. Before the commencement of the Eocene period, it is wrapped in what appears at present impenetrable darkness and mystery. Throughout the vast Tertiary period, fragments here and fragments there stand out among the ruins, from which we endeavour to reconstruct our edifice, just as the skilful architect or antiquary, from the shattered pieces of marble or stone of an ancient temple, will restore to us the noble form and proportions it once bore. One thing may be said with certainty upon this subject: every fresh discovery that has been made has tended to corroborate, and nothing has been found inconsistent with this, the grandest and most sublime, and, at the same time, most reasonable view of the method by which the living beings around us have been fashioned into the shapes in which we now see them.

A few more words may be said upon the important subject of specialisation, which will be so frequently referred to in what follows. It may be of three principal kinds: 1. The addition of parts not met with in the generality of animals, and, as far as is known, not found in the earliest members of the groups which afterwards possess them—as, for example, the antlers of deer, the horns of oxen or the rhinoceros. 2. The suppression of parts commonly present—as the upper incisor teeth of ruminants, the tails of bears, guinea-pigs, &c., the outer toes of the horse, the entire hind limbs of porpoises, &c. 3. The modification of the form, size, or relation of parts—as the immense development of the canine teeth in the walrus and male musk-deer, the complicated foldings of the molar teeth of elephants, &c.

It is proposed in this paper to treat of the horse, not as an isolated form, but as one link in a great chain, one term in a vast series, one twig of a mighty tree; and to endeavour to trace, as far as our present knowledge permits, what its relations are to the rest, and by what steps of modification in its various parts it has come to be the very singular and highly-specialised animal we have now before us, so distinct from all existing forms of life that, in most of the older zoological systems, it was

¹ The latest of the great periods into which geologists divide the age of the earth is called Tertiary, or Cainozoic. It is subdivided into Eocene, Miocene, Pliocene, and Pleistocene, the last being that which immediately preceded the one in which we are now living.

(at least, associated only with some very immediate allies, structurally almost identical) placed in an order apart from all other mammals, under the name of *Solidungula*, *Solipedia*, or *Mono-dactyla*—the animal with the solid foot, or, rather, with a single toe on each extremity.

To understand the natural place of the horse in the zoological system, it will be necessary to take a wide glance at the whole group to which it belongs. That it is a vertebrate animal, and that it occupies a place in the class *Mammalia*, no one will doubt. In that class it belongs to the great order *Ungulata*, or hoofed animals, the principal characters of which are the following: They are all eminently adapted for a terrestrial life, and, in the main, for a vegetable diet. Their molar teeth have broad crowns, with tuberculated, or ridged grinding surfaces, and they have a very completely-developed set of milk-teeth. Their limbs are adapted for carrying the body in ordinary terrestrial progression, and are of very little use for any other purpose, such as flying, climbing, seizing prey, or carrying food to the mouth. They have no collar-bones. Their toes are provided with blunt, broad nails, which, in the majority of cases, more or less surround and enclose their ends, and are called 'hoofs.' The great majority of Ungulate animals belong to either one or the other of two great and perfectly distinct sections, which differ from each other in very many points in their structure, the most obvious of these being the characters of their limbs, from which the names of the groups, or sub-orders, are derived. One is called *Artiodactyla*, or "even-toed;" the other, *Perissodactyla*, or "odd-toed." In the former, the third¹ and fourth toes of both feet are almost equally developed, and flattened on their inner, or contiguous surfaces, so that each is not symmetrical in itself; but when the two are placed together, they form a figure symmetrically disposed to a line between them—the so-called cloven hoof. These two toes are always present, and well developed; the second and fifth may be present in varying degrees of development, or may be entirely absent; the first is not present in any known member of the group, even the most ancient.

In the *Perissodactyle* group, the middle or third toe of both fore and hind feet is larger than any of the others, and sym-

¹ The number of toes in mammals never exceeds five. For convenience of description, they are designated numerically, from the inner side of the limb—I, II, III, IV, and V.—the pollex (thumb) and hallux (great toe) being the first of the fore and hind limbs respectively, and the third is the middle of the complete series. When the number falls short of five, it is always easy to determine, by their relations to the bones of the wrist or ankle, which of the typical series are present and which are missing.

metrical in itself, the free border of the last bone (which supports the hoof) being evenly rounded. This may be the only toe sufficiently large to be of any use to the animal, or the second and fourth may be equally developed on each side of it. In tapirs, and in many extinct forms, the fifth toe also is present on the fore-foot; but this does not interfere with the symmetrical arrangement of the remainder of the foot around the median line of the third, or middle digit. A first toe or thumb (pollex), completing the typical five, has only been found in some extremely ancient and primitive forms.

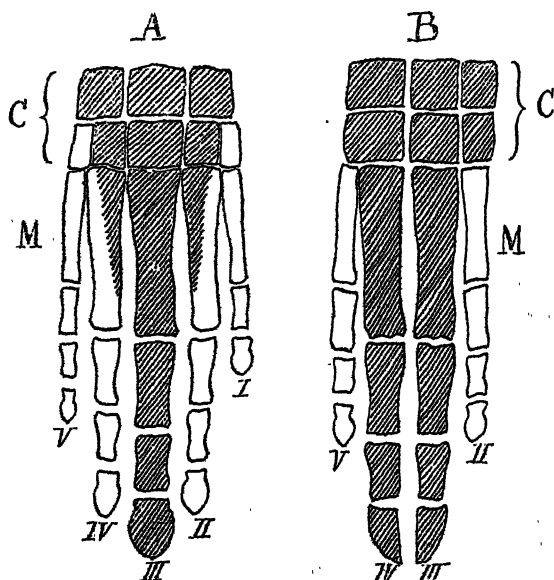


Fig. 1.—A. Diagrammatic representation of the fore-foot of an odd-toed or *Perissodactyle* animal. B. Of an even-toed or *Artiodactyle*. C. Corpus or wrist. M. Metacarpus. The toes are numbered as generally counted in order from the inner to the outer side of the foot. The shaded parts of A are those that are present in the Horse; in B, those that are present in the Ox.

It is only by studying the fundamental type of organisation common to all the members of a group, which underlies the various external or superficial modifications by which it becomes adapted to the different surrounding conditions under which it has to carry on its existence, that the true relationship of animals can be determined. In this way it can be clearly demonstrated that the pig, the deer, the ox, sheep, goat, antelope, and camel, including even such extreme forms as the giraffe and the hippopotamus, are formed on one common plan—the

Artiodactyle; while the horse, the tapir, and the rhinoceros, are formed upon the other—the Perissodactyle type, to which, therefore, we may here solely confine our attention.

The remains of animals to which it is possible to trace back these three existing forms, through a series of gradual modifications, without any great break, are found in abundance in the lower strata of the great lacustrine formations assigned to the Eocene period, spread over considerable portions of the present territories of New Mexico, Wyoming, and Utah, in North America. Similar animals also existed in other parts of the world; but in Europe, the hitherto-discovered fragments which prove their existence are in a less complete and satisfactory condition for investigation. After giving a summary of what was then known of the ancestry of the horse, as revealed by palæontological evidence, Professor Huxley wrote in 1877:—"The knowledge we now possess justifies us completely in the anticipation that, when the still lower Eocene deposits, and those that belong to the Cretaceous epoch, have yielded up their remains of ancestral equine animals, we shall find, first, a form with four complete toes, and a rudiment of the innermost, or first digit in front, with probably a rudiment of the fifth digit in the hind foot; while, in still older forms, the series of digits will be more and more complete, until we come to the five-toed animals, in which, if the doctrine of evolution is well founded, the whole series must have taken origin."

This anticipation has been completely verified by the discovery, among others, of an animal called *Phenacodus* in the oldest of the Tertiary formations of North America. Skeletons of this animal in a remarkably complete state of preservation have been described by Professor Cope. They show an extremely primitive or generalised structure—as much so, indeed, as in any known mammal. The teeth had very short crowns, with tuberculated surfaces, and were adapted for an omnivorous diet. There were five toes on each limb, which carried hoofs at the extremities. The head was very small, and the size and shape of the brain-cavity indicated a low state of development of the organ it contained. As many as nine different species have been already described, varying in size from a bulldog to a leopard or sheep. The next very distinct stage of evolution leads us to a small animal, not larger than a fox, which once inhabited our own island, as the first indication of its existence was a skull discovered, in 1839, in the London clay of Herne Bay, to which Owen gave the name of *Hyracotherium*. In this and many allied forms the number of toes was reduced to four on the front foot, and three on the hind foot, No. I. being absent in

the first case, and Nos. I. and V. in the second; whilst other changes had taken place in the skeleton and in the teeth that would require detailed description and illustrations in order to be intelligible.

The animals formed upon this type, which are met with in a somewhat later geological epoch, present considerable diversity of characters, and we find them gradually breaking up in different groups, some of which, after undergoing a considerable degree of specialisation, became extinct without leaving successors. But three of these modified types, already distinct at the close of the Eocene period, have continued up to the present day, gradually, as time advanced, becoming more and more divergent from each other. These, as already mentioned, are now represented by the three families of the tapirs, the rhinoceroses, and the horses.

The tapirs have retained much more of the original character of the primitive Ungulates of the Eocene period than any of the others, and have, indeed, remained practically unchanged since the Miocene period; while almost all other mammalian forms which existed then have either become extinct or undergone extensive modification. They appear now to be animals tending to extinction, for though formerly having had a wide range of distribution, through the continents of America, Europe, and Asia, they are now only found at two rather isolated parts of the world—i.e. South and Central America, and the Malay region—and they are by no means numerous either in species or individuals. They are shy, solitary, nocturnal, and inoffensive animals, chiefly frequenting the depths of shady forests and the neighbourhood of water, to which they frequently resort for the purpose of bathing, and in which they will take refuge when pursued. They feed chiefly on various vegetable substances, as shoots of trees and bushes, buds and leaves. Their nose is prolonged into a sort of short, prehensile proboscis. In the structure of the feet they scarcely differ from *Hyracotherium*. They are, in fact, as mentioned before, good old conservatives, which have scarcely departed in any way from the manners, customs, or structure of their ancestors.

The second branch of the family can be traced through gradual modifications to the modern rhinoceroses, which in many respects are more specialised than the tapirs. They have but three toes upon each foot, and the teeth have been considerably changed, some species having lost all the incisors, or cutting teeth, of the front of the mouth. They have, moreover, acquired the peculiarity of wearing one or two large horns upon their noses, which the early species of the family did not possess.

Rhinoceroses were at one time abundant in North America, but at the present day they are confined to Africa and the southern parts of Asia. They are all animals of large size but of little intelligence, generally timid in disposition, though ferocious when attacked and brought to bay, using their nasal horns as weapons, by which they strike and toss their assailants. Their sight is dull, but their hearing and scent are remarkably acute. They feed on herbage, shrubs, and leaves of trees, and, like so many other large animals which inhabit hot countries, sleep the greater part of the day, being most active in the cool of the evening, or even during the night. They are fond of bathing and wallowing in water or mud. As with the tapirs, none of the species have been domesticated.

The horse family are the most progressive members of the group, having undergone a more complete series of changes, in many parts of their structures, than either of the others—modifications all in adaptation to a changed mode of life. All the existing members of the group inhabit open plains, prairies, steppes, or deserts. They save themselves from their enemies, the larger carnivora, not by hiding among the recesses of thickets, as the tapir, or by their great size and strength, as the rhinoceros, but by the acuteness of their senses of sight, smell, and hearing, and by their marvellous speed. Their limbs are eminently adapted for galloping over hard ground, not for plodding deliberately through swamps; and their teeth are admirably modified for masticating the harsh, dry herbage of the plains, not the soft, succulent vegetables of the marshes and forests, in which their ancestors mainly dwelt.

The existing species of the genus *Equus*, or horse, are the following :—

(1.) The horse (*Equus caballus*), distinguished from all the others by the long hairs of the tail being more abundant, and growing quite from the base, as well as from the end and sides, and also by possessing a small, bare callosity on the inner side of the hind leg, just below the hock, or heel-joint, in addition to the one on the inner side of the fore-arm, above the carpus ("knee-joint"), common to all the genus. The mane is also longer and more flowing, the ears shorter, the limbs longer, the toes broader, and the head smaller. Fossil remains of horses differing but slightly from the smaller and inferior breeds of those now existing are found abundantly, in deposits of the most recent geological age, in almost every part of America, from Eschscholtz Bay in the north to Patagonia in the south. In that continent, however, they became quite extinct, and no horses, either wild or domesticated, existed there at the time of the Spanish conquest, which

is the more remarkable as, when introduced from Europe, the horses that ran wild proved by their rapid multiplication in the plains of South America and Texas that the climate, food, and other circumstances were highly favourable for their existence. The former great abundance of horses in America, their complete extinction, and their perfect acclimatisation when re-introduced by man, form curious, but as yet unsolved, problems in the geographical distribution of animals.

In Europe, wild horses were extremely abundant in the Polished Stone period, before the annals of our present historical age commenced. Judging by the quantity of their remains found associated with those of the Man of that time, the chase of these animals must have been among his chief occupations, and they must have served him with one of his most important food-supplies. The character of the bones preserved, and certain rude but graphic representations carved on bones or reindeer's antlers found in caves in the South of France, enable us to know that they were rather small in size and heavy in build, with large heads and rough, shaggy manes and tails—much like, in fact, the present wild horses of the steppes of Russia. These horses were domesticated by the inhabitants of Europe before the dawn of history; but it is doubtful whether the majority of the horses now existing on the Continent are derived from them, as it is more probable that they are the descendants of horses imported, through Greece and Italy, from Asia, derived from a still earlier domestication, followed by gradual improvement through long-continued attention bestowed on their breeding and training. Horses are now diffused, through the agency of man, throughout almost the whole of the inhabited part of the globe, and the great modifications they have undergone in consequence of domestication and selective breeding are well known to all. In Australia, as in America, horses imported by the European settlers have escaped into the unreclaimed lands, and multiplied to a prodigious extent, roaming in vast herds over the plains where no hooved animal ever trod before.

(2.) The domestic ass (*Equus asinus*) is nearly as widely diffused and useful to man as the horse. It was known in Egypt long before the horse, and is probably of African origin, as it has lately been found in a wild state in the highlands of Abyssinia.

(3.) The Asiatic wild ass (*Equus hemionus*), which roams in small herds in the open plains of Syria, of many parts of Persia, and of the north-west of India, and in the highlands of Tartary and Tibet, from the shores of the Caspian to the frontiers of China, differs from the last in being of a redder or

more yellow colour, instead of pure grey, in wanting the dark streak across the shoulder, and in having smaller ears. It has a dark-coloured stripe along the middle of the back. There are several distinct varieties, which some naturalists consider species—the Syrian wild ass; the Onager from Persia, the Punjab, Scinde, and the Desert of Cutch; and the Kiang, or Dzeggetai of the high table-lands of Tibet, where it is usually met with at an elevation of 15,000 feet and upwards above the sea-level. They are all remarkably swift, having been known to outstrip the fleetest horse in speed.

Lastly, there are three, or perhaps four, striped species, all inhabitants of Africa—the quagga (*Equus quagga*), the dauw, or Burchell's zebra (*Equus Burchelli*), the mountain zebra of the Cape Colony (*Equus zebra*), and another recently discovered in eastern Africa, called *Equus grevyi*. At the beginning of the present century these were all exceedingly abundant, especially Burchell's zebra and the quagga, which roamed in enormous herds over the great plains north of the Orange River; but since the introduction of European firearms, their numbers are rapidly diminishing, and their complete extermination seems to be only a question of time.

There are thus at least six modifications of the horse type at present existing sufficiently distinct to be reckoned as species by zoologists, and easily recognised by their external characters. They are, however, all so closely allied that each will, at least in a state of domestication or captivity, breed with perfect freedom with any of the others. Cases of fertile union are recorded between the horse and the quagga; the horse and dauw or Burchell's zebra; the horse and the hemionus or Asiatic wild ass; the common ass and the zebra, the common ass and the dauw, the common ass and the hemionus, the hemionus and the zebra, and the hemionus and the dauw. The two species which are, perhaps, the farthest removed in general structure—the horse and the ass—produce, as is well known, hybrids or mules, which, in some qualities useful to man, excel both their progenitors, and in some countries, and for certain kinds of work, are in greater requisition than either. Although occasional instances have been recorded of female mules breeding with the males of one or other of the pure species, it is doubtful if any case has occurred of mules breeding with one another. The different species of the group are, therefore, now in that degree of physiological separation which enables them to produce offspring with each other, but does not permit the progeny to continue the race, at all events, unless reinforced by the aid of one of the pure forms.

In turning to the consideration of the anatomical structure of the horse, it will only be possible, in the space allowed for this paper, to speak briefly upon certain points of special interest connected with its present mode of life, its evolution, and its relation to other animal forms.

I will first take an obvious external characteristic—the so-called “chestnuts,” or “mallenders” and “sallenders,” as they are designated in old books. These are certain patches upon the inner side of the limbs of all horses, definite in form and definite in position, in which the structure of the skin is different from what it is in other places. The papillæ of the derm or true skin are enlarged, and an abundant and thickened epidermal covering, which becomes dry and horny, and sometimes accumulates in considerable quantity on the surface, takes the place of the usual hair. Their structure, in fact, is much like that of a wart or corn; but they are not a pathological product, though often treated as such in old books on veterinary surgery. They exist at birth, are equally developed in both sexes, and their constancy of form, size, and position (as mentioned before), give one of the characteristic distinctions of the species *Equus caballus*. They differ in form in the two limbs, but are in both placed upon the inner surface, and nearer to the hinder than the front border. That on the fore-limb is *above* the carpal, or wrist-joint (commonly called “knee”), that on the hind limb, *below* the ankle, or “hock” joint. In the donkeys and zebras the hinder one is absent, but the one upon the fore-limb exists, though in a modified form. In the zebra it is a large, circular patch of bare skin, of a black colour, but scarcely elevated above the surrounding surface.

The signification and utility of these structures are a complete puzzle. Various suggestions have been made, none of which will bear examination. One of the most plausible, especially in the light of modern comparative anatomy, is that that they are rudiments or vestiges of the inner toe—the thumb or pollex of the fore-limb, the great toe or hallux of the hind limb—which, as already indicated, and will be more fully shown presently, is not otherwise represented in the horse. There are, however, many objections to this theory. The inner toe is always the first to disappear in all mammals, and no traces of it are found in any Ungulate, either Perissodactyle or Artiodactyle, except the most ancient forms. It is, therefore, most unlikely that anything of this digit should remain in the horse after the complete disappearance of the second, fourth, and fifth. In the next place, there is nothing beneath the modified patch of skin showing any trace of the structure of a toe, and the resemblance of this patch

to a hoof is of the very slightest character, especially in the donkeys and zebras, where, indeed, it has none. But the most serious objection is the situation of the one that is most constant—that on the fore limb—where it is placed, not on the hand, as it would be, if it represented the thumb, but upon the arm, at some distance above the wrist-joint. Lastly, such a hypothesis is quite unnecessary, for they obviously belong to a numerous class of special modifications of particular parts of the cutaneous surface, which occur in very many animals, the use of which is in most cases remarkably obscure. Bare spots, thickened patches or callosities, and tufts of elongated, or modified hair, often associated with groups of peculiar glands, are very common in many parts of the body, but especially the limbs, of many Ungulates, and to this category undoubtedly the “chestnuts” of the horse belong. If they teach us nothing else, they afford a valuable lesson as to our own ignorance of the meaning and the use of a structure so conspicuous to observation, and in an animal whose mode of life, almost more than any other, we have had the fullest opportunity of becoming intimately acquainted with. That they have some significance or utility cannot be doubted; but I must admit that it is at present beyond our powers to guess what it is, or to account for their presence upon any of the hitherto recognised principles of causation of animal modifications.

The nostrils of the horse are, as is well known, large, and very dilatable, allowing of the admission of a greater or less amount of air according to the demands of respiration. Owing to the structure of the soft palate, and its relation to the upper end of the larynx, breathing takes place entirely through the nose. When men, dogs, and many other animals, owing to any great exertion, begin to pant, and require an additional quantity of air to that which is ordinarily taken in by the nose, the mouth comes to the aid of that channel, and is widely opened; but the horse, under the same circumstances, can only expand the margins of the nostrils, for which action there is a very efficient set of muscles, acting upon the cartilaginous framework which supports them and determines their peculiar outline. Immediately within the margin of the upper part of the nostril is a structure of very considerable interest, which is generally supposed to be peculiar to the horse and its immediate allies, as the ass, the use of which is entirely unknown. It is a blind pouch, about three inches in depth, conical in form, though slightly curved, and lying in the cleft seen in the dried skull between the nasal and the premaxillary bones. It is a diverticulum from the nasal passage, with which it freely communicates below, and is lined by a continuation of the same mucous

membrane. In veterinary surgery it is called the "false nostril."

If this were all we knew about this organ, it would be unsatisfactory enough; but it immediately acquires interest when we know that in the tapir a similar structure, only in a very much more developed condition, is found. In that animal it runs upwards, as a long, narrow tube, from the external nostril, at first in contact with its fellow of the opposite side, and afterwards, taking a curiously-curved course, terminates in a dilated, closed extremity, which lies in a distinct groove by the side of the upper part of the nasal bone. Its walls are cartilaginous, and convoluted in such a manner as greatly to increase the area of the internal surface. It is obvious that the "false nostril" of the horse cannot be looked upon as anything specially belonging to the economy of that animal, but as a rudimentary condition, or survival of some structure which is far more highly developed in some of the more primitive forms of Perissodactyles. This view is greatly strengthened by the recent discovery of an exactly similar structure in the rhinoceros, only in a condition intermediate between that in which it is found in the horse and the tapir.

Thus, an organ which, when only known in one animal, appeared strange, anomalous, and puzzling, because there seemed nothing to account for its presence, acquires in the light of wider knowledge a much deeper interest; for, if we cannot even yet discover its purpose, its presence in some modification in all of these three now very distinct forms, and in, as far as is known, no other mammals, is a strong corroboration of the view, formed upon other evidence, of their close affinity and common descent.

Other equally mysterious structures are the "guttural pouches," also diverticula of the respiratory passages, large cavities, one on each side, situated at the base of the skull, behind the pharynx, and connected with the Eustachian tubes, and which, in the most approved works on veterinary anatomy, are said to be "found only in Solipeds." Exactly similar pouches exist in the tapir, but I am not aware whether they have as yet been looked for in the rhinoceros.

The next parts to which attention may be called are the teeth, which in the horse, though founded upon the same general type as the primitive Ungulates of the Eocene period, have undergone a remarkable amount of specialisation, which fits them in an eminent degree for the purpose they have to fulfil.

For convenience of description, teeth are divided, according to their situation in the mouth and other characters, into four

sets, called (beginning from the front) *incisors*, *canines*, *pre-molars*, and *molars*; and all the early Ungulate animals had, without exception, on each side, above and below, three incisors, one canine, four premolars, and three molars—that is, eleven on each side above and eleven below, or forty-four altogether. The modern horse has very nearly, but not quite, this full number. The front teeth, or incisors, are the same, taking the two sides together, six above and six below. The canines or “tushes,” are present, as a rule, only in the males. The cheek-teeth, or molars and premolars, taken together (for there is very little to distinguish them in form or size), are generally but six, instead of seven. Here, then, is a case of specialisation by suppression. One of the teeth of the ancient forms has disappeared. Which is it? The examination of fossil remains shows us that the first of the series—the anterior premolar, a fairly large and well-developed tooth in *Phenacodus* and *Hyracotherium*—gradually became smaller and smaller as time advanced. But has it entirely disappeared in the modern horse? What do we read in old books on veterinary surgery?—“Wolves’ teeth are two very small, supplementary teeth, appearing in front of the molar teeth, and supposed to have an injurious effect on the eyes (!), and are therefore often removed by farriers.” These little rudiments of teeth, about which such nonsense as the above has been written, are, when properly understood, of intense interest.

Their diminutive size, their irregular form and inconstant presence, combined with their history in the extinct horse-like animals, show them to be teeth which, for some reason to us at present unknown, have become superfluous—have been very gradually and slowly (as in the case of all operations of the kind) dispensed with, and are, in the stage to which the horse has now arrived in its evolution, upon the point of disappearance. The presence of these so-called “wolves’ teeth” alone is sufficient, if we had no other proof, to show that the horse is not an isolated creation, but one link in a great chain of organic beings.

The six remaining molar teeth (or, rather, three premolars and three true molars) have undergone a remarkable series of modifications as time advanced. The crowns of all these teeth in the early forms were very short; there was a distinct constriction—the neck—between the crown and the roots, and when the teeth were developing, as soon as the neck once rose fairly above the alveolar margin, the tooth remained permanently in this position. The term “brachydont,” or short tooth, expresses this condition. The free surface had two, nearly transverse, curved ridges, with valleys between, and had no deposit of cementum filling them, the whole exposed surface of the

unworn tooth being coated with enamel, the hardest substance entering into the formation of animal bodies. When the ridges became worn down, the dentine, or ivory of the interior, was exposed, forming islands surrounded by enamel. With the progress of time horse-like animals appeared with the crowns of the teeth gradually becoming longer, the valleys deeper, and the ridges not only more elevated, but more curved and complex in arrangement. To give support to these high ridges, and to save them breaking in use, the valleys and cavities between them became filled up to the top with a bony substance, called cement, and as the crown wore down an admirable grinding surface, consisting of patches and islands of the two softer substances, dentine and cementum, separated by variously re-

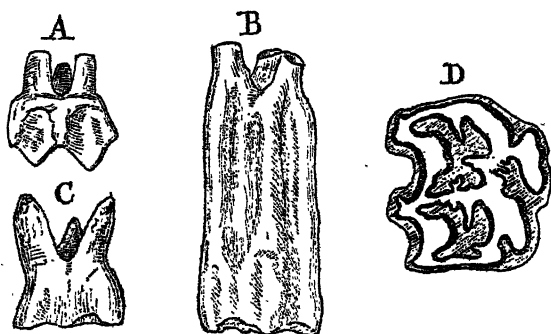


Fig. 2.—A. Side view of upper molar tooth of *Anchitherium* (brachyodont form). B. Corresponding tooth of horse (hypsodont form). C. The same tooth of an old horse with the greater part of the crown worn away, and the roots fully formed. D. Grinding surface of the molar tooth of a horse. The uncoloured portion is the dentine or ivory; the shaded part the cementum, filling the cavities and surrounding the exterior; the black line separating these two is the enamel or hardest constituent of the tooth.

duplicated and contorted projecting lines of intensely hard enamel, resulted. The crown continued lengthening throughout the Pliocene time, until, in the modern horse, it assumed the form called "hypsodont," or high-toothed. Instead of contracting into a neck, and forming roots, its sides continue parallel for a considerable depth in the socket, and as the surface wears away the whole tooth slowly pushes up, and maintains the grinding edge constantly at the same level above the bone, much as in the perpetually-growing teeth of rats and beavers. But in existing horses there is a limit to the growth of the molar. After a length is attained which, in normal conditions, supplies sufficient grinding-surface for the lifetime of the animal, a neck and roots are formed, and the tooth is reduced to the condition

of that of the brachydont ancestor. It is perfectly clear that this lengthening of the crown adds greatly to the power of the teeth as organs of mastication, and enables the animals in which it has taken place to find their sustenance among comparatively dry and harsh herbage, the stalks of which often contain much hard mineral matter, instead of being limited to the more soft and succulent vegetable productions of the marshes and forests, in which the primitive brachydont forms of Ungulates mostly dwelt.

The incisors, or front teeth of the horse, have a peculiarity not found in those of any other mammal, and seen only in the *Equidæ* of comparatively recent geological formations. In the most primitive species these teeth were simple, and chisel or awl shaped; when their crowns became worn in consequence of long-continued use, they presented an external ring of enamel, surrounding a core of the dentine, or ivory, of which the bulk of the tooth is composed. The next modification consisted in the development of a ridge along the hinder border of the base of the crown. By the continuous increase of this ridge, and its union with the edges of the main part of the crown, a deep hole is produced, the orifice of which is transversely elongated, and placed rather behind the cutting-edge of the tooth. This is the condition seen in a colt's incisor which has just cut the gum. As wear takes place, the surface, besides the external enamel layer, as in an ordinary simple tooth, shows, in addition, a second inner ring of the same substance surrounding the pit, which, of course, adds greatly to the efficiency of the tooth as an organ for biting tough, fibrous substances. This pit, generally filled in the living animal with particles of food, is conspicuous from its dark colour, and constitutes the "mark" (Fig. 3 a), by which the age of the horse is judged; and in consequence of its only extending to a certain depth in the crown, it becomes obliterated as the tooth wears away, which then assumes the character of that of an ordinary incisor, consisting of only a core of dentine, surrounded by an external enamel layer.

The modifications of the limbs which took place *pari passu* with those of the teeth must have been associated with increased speed, especially over firm and unyielding ground. Short, stout legs, and broad feet, with numerous toes, spreading apart from each other when the weight of the creature is borne on them, are sufficiently well adapted for quietly walking over marshy and yielding surfaces, and the tapirs and rhinoceroses—which, as mentioned before, have altered comparatively little from the primitive Eocene forms—still haunt the borders of streams and the shady depths of the forests, as was probably the habit of their

ancient representatives, while the horses are all inhabitants of the open plains, for life upon which their whole organisation is in the most eminent degree adapted. The length and mobility of the neck, the position of the eye and the ear, and the great development of the organ of smell, give them ample means of becoming aware of the approach of enemies; while the length of their limbs, the angles the different segments form with each other, and especially the combination of firmness, stability, and

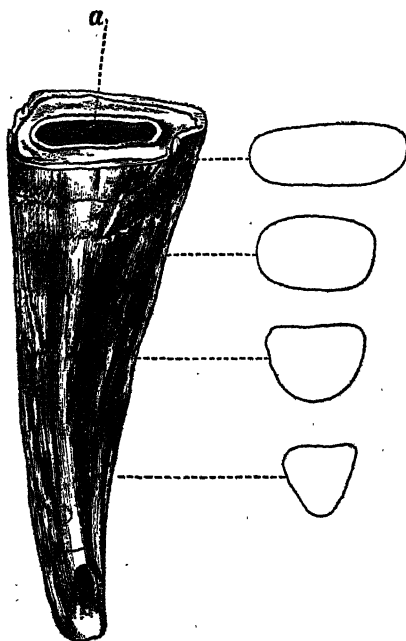


Fig. 3.—*Permanent incisor of the Horse.*¹ [See page 125.]

lightness in the reduction of all the toes to a single one, upon which the whole weight of the body and all the muscular power of the limb are concentrated, give them speed and endurance surpassing those of almost any other animal.

If we were not so habituated to the sight of the horse as hardly ever to consider its structure, we should greatly marvel at being told of an animal so strangely constructed that it had but a single toe on each limb, on the end of the nail of which it walked or galloped. Such a formation is without a parallel,

¹ From Professor Brown's pamphlet on *Dentition as Indicative of the Age of the Animals of the Farm*, published by the Society.

and, indeed, is one of the most remarkable instances of specialisation or deviation from the usual type, in accordance with special conditions of life, which is known. It can be demonstrated, both by the structure of the foot itself, and also by an examination of the various intermediate fossil species, that this toe corresponds to the middle or third of the complete, typical five-toed foot—the “ring finger” of man; and there is very strong evidence to show that, by a gradual concentration of all the power upon this toe, and the concurrent dwindling away, and final disappearance, of all the others, the present condition of the horse’s foot has been produced.

The small, horse-like animals of the Eocene period, with five, four, or three toes on each foot, have already been mentioned. In the next age of the world’s history—the early Miocene period—the animal most like the existing horse was the *Anchitherium*, the remains of which are found in a fossil state both in Europe and America. In this genus there were three well-developed toes reaching the ground on each foot, and the bones of the fore-arm (radius and ulna), and those of the leg (tibia and fibula), were fully developed and distinct. This animal was succeeded by animals which have been named *Hipparion*, *Hippotherium*, *Protohippus*, and *Pliohippus*, of which there were many kinds, differing slightly in form and proportions, and in the characters of the enamel foldings of their molar teeth, but resembling each other in the structure of the feet. In these the lateral toes, though containing the full number of bones, were much reduced in size, and did not reach the ground, but were suspended to the outside of, and rather behind, the large middle one, like the rudimentary outer toes of the deer; or the short, first digit (“dew-claw”) of the dog. Horses, or, rather horse-like creatures, with this structure of feet, were no longer met with when the Pleistocene, or latest geological period, set in; but then, for the first time, appeared the true horse, in its development exactly, or very nearly, as we know it now. The outer toes (second and fourth) were reduced to rudiments of the metacarpals or metatarsals only—the so-called “splint bones”—entirely concealed beneath the skin, while the middle or third toe was greatly elongated, and had its last bone (ungual phalanx, *os pedis*, or “coffin-bone”) much expanded in breadth. At the same time, the stability of the fore-arm and leg was increased by the two bones contained in each in the primitive forms being completely fused into one. Even since the Pleistocene period a change has taken place, as in horses of the present time the lateral rudimentary metacarpals, or splint bones, though independent bones in the young animal, have a

great tendency to become united with the large middle bone as life goes on; but in the horses of prehistoric, or still earlier, times, they are always found free.

If space permitted, numerous other points of interest about the structure of the horse's limbs could be adduced as indicative of its position in Nature and probable descent. The number, arrangement, and relations of the muscles, especially the presence of some in a perfectly rudimentary state—mere vestiges

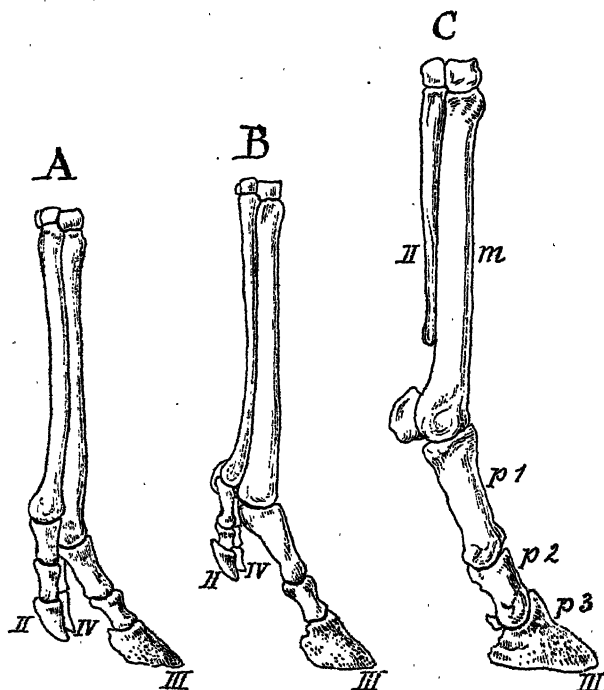


Fig. 4.—Side view of the skeleton of the foot of—A. *Anchitherium*. B. *Hipparion*. C. Horse (from Gaudry, "*Les Ancêtres de nos Animaux*"). II, III, and IV. Second, third, and fourth of the complete series of toes. m. Metacarpal. p 1. First phalanx or great pastern. p 2. Second phalanx or lesser pastern. p 3. Third or ungual phalanx; coffin bone.

of those which in animals with many toes cause not only the actions of bending and straightening, but also the various movements from side to side—can only be explained upon the supposition that the horse is the modified descendant of a more generalised type of animal, a view which is now held by most zoologists who have given much study to this question, and for which the principal evidence has been briefly set forth in this paper.

W. H. FLOWER.

BASIC CINDER AS MANURE.

BASIC cinder, known also as basic slag, Thomas' slag, Thomas' phosphate powder, and Thomas' powder, is a product of a process for converting phosphoric pig-iron into steel for which a patent was taken out by Messrs. Thomas & P. C. Gilchrist in the year 1879. About 85 per cent. of the known deposits of iron ore in Great Britain are phosphoric to the extent of containing one part or more of phosphorus per thousand of iron; probably this ratio holds good with the known iron ores of the world. In smelting this ore to make pig-iron, practically the whole of the phosphorus of the ore goes into the pig-iron. Such phosphoric pig is not suitable for making steel by the ordinary Bessemer, or by Siemens' process, as the phosphorus remains in the steel, and renders it "cold short." It follows, that only about 15 per cent. of iron ores, chiefly hæmatite, which are nearly free from phosphorus, can be used in steel-making by these processes.

Pig-iron made from the Cleveland, Staffordshire, Scotland, and other similar iron ores, contains phosphorus varying usually from about 0·8 up to 3 per cent. Pig-iron of this class can now, by the Thomas-Gilchrist process, be readily converted into first-class steel and ingot-iron.

The process most commonly used is a modification of the Bessemer process, though it may also be adapted to the Siemens' process, of steel-making. The "converter" into which the molten cast-iron is run is lined with magnesian limestone instead of with the usual siliceous ganister. Lime to the extent of about 15 or 20 per cent. of the weight of the cast-iron is thrown into the converter at the beginning of the "blow."

The "blow"—a powerful blast of air forced through the molten metal—is conducted as in the ordinary Bessemer process, but is continued a little longer than in the ordinary plan. The oxygen of the air unites with the impurities of the pig-iron, with the phosphorus to form phosphoric acid, which in its turn unites with the lime to form phosphate of lime. Some of the iron is also oxidised to form ferrous and ferric oxides. When the "blow" is finished—in about fifteen minutes—most of the oxidised substances are found floating on the surface of the steel as slag, or cinder, which is then removed by tipping the converter. This cinder forms a dark-coloured, vesicular substance, containing an admixture of fragments of steel and separate crystals of phosphate of lime.

The slag, on being freed from metallic iron and finely powdered, has about the following percentage composition :—

	Percentage composition		Percentage composition
Phosphoric acid	16·5	Sulphuric acid	·2
Lime	49·0	Silica	7·0
Magnesia	5·0	Alumina	2·0
Ferrous oxide	11·0	Moisture, carbonic acid, alkalis, &c.	1·5
Ferric oxide	3·5		
Manganese oxide	3·5		
Vanadium oxide	·2		
Sulphide of lime	·6		100·0

This percentage of phosphoric acid is equivalent to 36 per cent. of tribasic phosphate of lime (bone-earth).

By a modification of the process, under Schleibler's patent, by which insufficient lime is added in the first place to ensure complete dephosphorisation of the iron, a slag richer in phosphates is obtained, containing 24 to 28 per cent. of phosphoric acid, which is sold under the name of "Patent Phosphate Meal." This modified process is not, however, largely used.

The steel made by the Thomas-Gilchrist process is very free from phosphorus, containing from none up to about ·06 per cent. Last year the make of steel in this country by this process was nearly 500,000 tons, and the total make in all countries over 2,250,000 tons, an increase of 320,000 tons over that of the previous twelve months. In England, the chief works using it are in the Cleveland district, at Middlesbro', and in South Staffordshire, at Wolverhampton.

The following tables show the progress of the process from the commencement of its use till the end of last year :—

TABLE Showing the Amount of Basic Steel, or Thomas-Gilchrist Steel, made Annually from 1878 to 1889 inclusive.

Year	England	Other Countries	Total
	Tons	Tons	Tons
1878	20	—	20
1879	1,150	50	1,200
1880	10,000	40,000	50,000
1881	46,120	289,880	336,000
1882	109,364	340,636	450,000
1883	122,380	511,993	634,373
1884	179,000	685,000	864,000
1885	145,707	799,610	945,317
1886	258,466	1,055,165	1,313,631
1887	435,046	1,589,025	2,024,011
1888	408,594	1,544,640	1,953,234
1889	493,919	1,780,633	2,274,552
Totals .	2,209,766	8,636,632	10,846,338

The amount made in the different countries for the years ending December 31, 1888, and December 31, 1889, respectively, was as follows:—

Country	1889		1888	
	Total	Ingot-iron under 17 per cent. carbon	Total	Ingot-iron under 17 per cent. carbon
	Tons	Tons	Tons	Tons
England	493,919	348,828	408,594	276,476
Germany and Austria . . .	1,481,642	1,185,323	1,276,070	1,026,033
France	222,392	159,271	222,333	158,223
Belgium and other countries.	76,599	71,217	46,237	32,300
Total . . .	2,274,552	1,764,639	1,953,234	1,493,032

With this $2\frac{1}{2}$ million tons of basic steel, about 700,000 tons of basic slag, containing phosphoric acid equal to about 36 per cent. of phosphate of lime (bone-earth), were produced.

With the formation of this phosphoric slag, or basic cinder, arose the question, Can it be used as a manure to supply farm-crops with phosphoric acid? The first, somewhat rough, experiments made with the slag itself in the neighbourhood of works producing it, and some made at Cirencester by the author, gave varying, and, on the whole, rather unsatisfactory, results, due, as we now know, to the slag not being sufficiently finely powdered. Scores of patents were taken out for processes by which the phosphoric acid might be utilised, mainly for agricultural processes. One of these was worked to a rather large extent. By it a fine, precipitated phosphate of lime, mainly dibasic phosphate, is produced, containing 32 to 33 per cent. of phosphoric acid, equivalent to 70–73 per cent. of ordinary phosphate of lime. This is an excellent manure, but its high price prohibits its extensive use.

There is now abundant evidence to show that the raw cinder, if very finely ground, is a very efficient phosphatic manure. That the ferrous oxide present is not in a form in which it is injurious to plants, is shown by the fact that dressings of one, two, and even three tons per acre may be given without injurious effects, though, it is true, with no more beneficial effects than very much smaller dressings. Chemical investigation has shown that the phosphoric acid is combined with lime, chiefly in the form of tetrabasic phosphate (4CaO , P_2O_5 , or $\text{Ca}_4\text{P}_2\text{O}_8$), not in the more commonly occurring form of tribasic phosphate ($\text{Ca}_3\text{P}_2\text{O}_8$).

The phosphate in this form is much more soluble in water

containing carbonic acid, and in dilute saline solutions, than is the ordinary mineral phosphate of lime; and to this is doubtless due the greater efficiency of the basic cinder, provided it be very finely ground. The grinding was at first a great difficulty, principally owing to the fragments of steel present in the slag playing havoc with ordinary mills. This difficulty is, however, now overcome, and special machinery with roller mills is at work in several places for grinding the slag.

From 1882 onwards a great number of field and pot-culture experiments have been carried on with the ground slag in Germany and other parts of the Continent, and the results, on the whole, have been very favourable to the use of the slag: so much so, that by far the largest proportion of the slag produced in England has been sold to go to the Continent. Some of the most carefully-conducted and most interesting of the culture experiments in pots have been conducted during several years by Dr. P. Wagner, Director of the Agricultural Experiment Station at Darmstadt, and certain of his experiments clearly show the importance of fine grinding.

In this country, the first systematic field experiments were made in 1885, by Mr. Wrightson and Dr. Munro, on swedes. These experiments were made partly at Ferryhill, Durham, on a stiff, deep clay, deficient in lime, and partly at Downton, Wilts, on a light, chalky soil. The season was a bad one for roots, but in the stiff, clay soil, the basic cinder at the rate of 4 cwt. per acre gave excellent results—better than an equal weight of mineral superphosphate. On the chalk soil the results were not so favourable, but the cinder, especially if applied in rather large dressings, gave very marked good results.

In 1886, the present writer, in conjunction with Mr. Russell Swanwick, carried out very numerous experiments with basic slag on the Royal Agricultural College Farm, both on swedes and on potatoes, and a few on grass land. Generally, the slag, which was used in varying amounts up to 1 ton per acre, gave an increase of about $3\frac{1}{2}$ tons of roots per acre over unmanured plots—not quite as much as was given by 3 cwt. of superphosphate. The quantity of slag applied, whether 4 cwt. or upwards, had little effect on the yield of the crop to which it was first applied: 4 cwt. and 6 cwt. gave as good results as 20 cwt. on the first crop. On potatoes, 10 cwt. of slag gave much the same results as 6 cwt. of mineral superphosphate. On grass, the slag had a good effect, but not quite equal to that produced by a somewhat smaller dressing of superphosphate. Other experiments were carried out in the same year by Mr. Warrington, on Sir J. B. Lawes's farm at Rothamsted; by Mr. W. Field, junr., at

Redbourne, Herts; by Dr. J. Aitken, at Pumpherston, Scotland; by Mr. D. Wilson, at Carbeth, Scotland; and by Mr. T. A. Dickson, Kinnersley, Herefordshire. The results of these experiments showed that on all these different soils the slag was an efficient phosphatic manure, in most cases—when applied in somewhat larger quantities—producing as large a yield as superphosphate.

Since 1886 this manure has been more extensively used, and seems to be slowly growing in favour. During the last three years a series of rather extensive experiments with it, on different crops, has been made by Mr. James Mason, at Eynsham Hall, Witney, Oxfordshire, on soils resting on the Oxford clay. Most of the results obtained have been favourable to the use of slag, and in some cases the effect of the residues of slag applied to previous crops on succeeding cereal crops has been very marked.

In response to an invitation to carry out experiments mainly with the object of testing the effect of basic cinder as compared with superphosphate, several Members of the Royal Agricultural College Club agreed, in 1889, to carry on a scheme of experiments on swedes as drawn up by myself. These members were:—Messrs. (1) G. J. M. Burnett, (2) H. Chancellor, (3) J. Edwards, (4) E. B. Haygarth, (5) Capt. M. J. Harrison, R.N., (6) E. Powell King, (7) Thomas Latham, (8) F. W. Silvester, and (9) Beville Stanier, and (10) the Royal Agricultural College. The seed and manure used in all cases were uniform. The superphosphate contained 26.8 per cent. of “soluble” phosphate, and 5.6 per cent. “insoluble” phosphate. The basic slag contained 17.8 per cent. of phosphoric acid, equivalent to 38.8 per cent. of tribasic phosphate of lime; 85 per cent. of it passed through a sieve of 100 meshes to an inch: the nitrate of soda contained 98.4 per cent. of pure nitrate.

The following proposals as to the carrying out of the experiments were circulated among the Members of the Club:—

Field Experiments with Manures on Swedes with Thomas' Basic Cinder and Superphosphate, with and without Nitrogenous Manures.

It is desired in these experiments to compare the effects of superphosphate with those of finely-divided basic cinder (or slag) obtained by the “Thomas-Gilchrist” process of making steel.

Each manure should be tried (1) alone, (2) in conjunction with farmyard manure, and (3) with mineral nitrogen, given in the form of a top-dressing of nitrate of soda.

The superphosphate (ordinary mineral superphosphate, 25% soluble) to be used at the rate of 3 cwt. per acre; the basic cinder at two different rates—4 cwt. and 6 cwt. per acre; and the nitrate of soda, as a top-dressing, at the rate of 1 cwt. per acre.

It is proposed in these experiments, in order to counteract differences

due to irregularity of the soil in different parts of the field; and at the same time to avoid the trouble of duplicate or triplicate plots, to sow the manures in alternate breadths (of two or three rows each, according to the number of coulters on the drill used) across the field.

Another advantage of this plan is that comparisons can be easily made at different parts of the field as to the condition of the crop at all periods of its growth.

In the proposed experiments there will be 3 phosphated series and one without phosphates—4 in all—each series tried on three different sections of land, making altogether 12 experiments.

Each section of the field may be as large as is convenient, provided the phosphatic manuring be repeated in alternate breadths.

It is very important that the drill deliver the amount of manure required evenly; and, if possible, trial should be made on unexperimental ground to test the delivering power of the machine when set.

The whole experimental area should be sown in one day, and as quickly as possible, so as to avoid any differences in growth brought about by showers at the time of sowing.

Should the nature of the soil indicate that potash is a desirable addition to the manuring, 3 cwt. kainit per acre may be sown broadcast across the rows over half the experimental area.

It is essential that the basic cinder be very finely divided; this, as well as the superphosphate, will be analysed in the laboratory of the Royal Agricultural College, and prepared and sent out under the instructions of Prof. Kinch.

Unfortunately, owing to bad season and other mishaps, some of the experimental results were of no value as showing the relative effects of the two forms of phosphates: thus, the swedes of Captain Harrison (5); at Shiprods, Slinfold, Sussex, were ploughed up without being weighed. Those of Mr. King (6), Wainsford, Lymington, Hants, suffered severely from clubbing. Those of Mr. Chancellor (2), at Chessington, Surrey, were a deficient plant, owing to the dry time at the end of June, and were very much affected by mildew, so that they were of no quantitative value. In Mr. Stanier's (9) experiments, at Peplow, Shropshire, unfortunately, the previous treatment of all the plots had not been quite similar, and the seed, owing to the wet weather, was sown very late. A very small crop was obtained, and the only marked result was the advantage of farmyard manure. Mr. Stanier also experimented at Cheswardine, Staffordshire. Here also no definite results were obtained from the use of either form of phosphate, though farmyard manure gave a good increase. In Mr. Latham's (7) experiments, there is evidence that the land was in too good condition, at all events as regards phosphates, for these to show any appreciable results.

Below are given the weights of roots obtained in the remaining five of this series of experiments:—

(1.) Mr. Burnett's experiments were carried out at Little Kendalls, Elstree, Herts, on a sandy soil, the previous cropping being: 1886, Swedes, manured and fed off with sheep receiving cake; 1887, Wheat; 1888, Barley

The dung was used at the rate of 18 tons per acre. The seed was sown on May 22.

(3.) Those of Mr. J. Edwards were carried out at Tyntesfield, Somerset, on a red loam overlying carboniferous limestone. Previous cropping: 1887, Swedes; 1888, Oats. The farmyard manure was used at the rate of 18 tons per acre. Seed sown on May 31. The nitrate was not applied till August 3. The tops were badly mildewed. The roots were weighed on November 6.

(4.) Mr. Haygarth experimented at Siddington, Gloucestershire, on a rather stony marl on the Forest Marble. Previous cropping: 1887, Wheat; 1888, Barley. Farmyard manure, 12 tons. All the artificials were sown with the seed on May 31, and the crop weighed on October 21.

(8.) Mr. Silvester's experiments were at Hedges, St. Albans, Herts, on a light soil on the glacial drift. They were in an ordinary five-course rotation. Farmyard manure, 12 tons. The phosphates and the seed were sown the second week in June, the nitrate when the roots were singled; and the crop was weighed the last week in October.

(10.) The Royal Agricultural College experiments were on calcareous clay on the Great Oolite. Previous cropping three years' roots. Farmyard manure, 12 tons per acre. The phosphates and the seed were sown on June 7,

Weight of Roots per Acre.

No. of plot	—	(1) G. J. M. Burnett	(3) J. Edwards	(4) E. B. Haygarth	(8) F. W. Sil- vester	(10) Royal Agri- cultural College
	<i>Farmyard Manure Series</i>	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
1	4 cwt. basic cinder .	15 19½	22 18	18 1½	14 17½	15 10½
2	3 cwt. superphosphate	21 8½	22 19½	20 0	17 17½	15 19½
3	Nothing extra . . .	17 2	20 15½	17 8	17 1½	14 0½
4	6 cwt. basic cinder .	16 19½	19 11½	17 12½	15 19½	14 12
	Average of farmyard manure plots . . .	17 17½	21 11½	18 5½	16 8½	15 0½
	<i>No Extra Manure Series</i>					
5	4 cwt. basic cinder .	15 16½	11 16½	14 8½	11 17½	12 6½
6	3 cwt. superphosphate	15 7½	15 11½	14 3½	13 6½	13 4½
7	Nothing	11 18½	6 9½	13 6	8 8½	11 8½
8	6 cwt. basic cinder .	14 18½	15 4½	14 11½	13 4½	(19 8½)
	Average of non-nitro- gen plots	14 5½	12 5½	14 2½	11 14½	12 6
	<i>Nitrate of Soda Series, 1 cwt. per Acre</i>					
9	4 cwt. basic cinder .	16 1½	14 2½	17 5½	11 7½	16 17½
10	3 cwt. superphosphate	17 3½	13 11½	18 5½	14 1½	19 11
11	Nothing extra . . .	15 17½	6 9½	16 12	6 10	17 15½
12	6 cwt. basic cinder .	16 1½	13 8	16 10½	7 12	16 17½
	Average of nitrate plots	16 6	11 8	17 3½	Last two unhealthy	17 15½

the nitrate on July 25; and the crop was weighed on November 13. Plot No. 8 in this series unaccountably gave very high results, which are excluded from further consideration. Both in these experiments and in Mr. Haygarth's, which were only distant about two miles, the phosphates gave lower results than are usual in this district on land in ordinary or rather poor condition.

In all these five cases the unmanured plot gave the lowest results. In all cases but the Royal Agricultural College, the plot with farmyard manure and superphosphate gave the highest yield of roots. At the Royal Agricultural College, nitrate of soda this season had a particularly good effect, and nitrate and superphosphate gave the highest result. In both Mr. Burnett's and Mr. Haygarth's experiments nitrate and superphosphate gave the second-best results. In Mr. Edwards's, farmyard manure 4 cwt., and slag, gave the second-best results; in Mr. Silvester's, farmyard manure alone. With Mr. Burnett and Mr. Silvester, although slag alone has proved a good manure, yet mixed with farmyard manure it seems to have had an ill effect on the yield. The reason of this is not obvious, but may have something to do with the presence of ferrous compounds. In the majority of cases, 6 cwt. of slag have given worse, or no better, results than 4 cwt. The slag alone has in nearly every instance given a good increase, in some cases equal to the superphosphate, but it appears to be more uncertain in its action than the latter, especially when mixed with farmyard manure or with nitrate. It seems, from these results, that it is not usually desirable to apply more than 4 cwt. of slag per acre for roots, and it is quite probable that, had the slag been applied earlier, before

	Tons of Roots per Acre				
	(1) Mr. Burnett	(3) Mr. Edwards	(4) Mr. Haygarth	(8) Mr. Silvester	(10) Royal Agricultural College
Average increase of farmyard manure series over non-nitrogen series . . .	3½	9½	4	4½	2½
Average increase of nitrate series over non-nitrogen series . . .	2	—	3	—	5½
Increase from 4 cwt. of slag alone over unmanured . . .	4 nearly	5½ nearly	1	3½	1
Increase from 6 cwt. of slag alone over unmanured . . .	3	8½	1½	5 nearly	—
Increase from superphosphate alone over unmanured . . .	3½	9	1 nearly	5	2 nearly

sowing the seed, its results might have been better, as it is a slow-acting manure. The 4 cwt. of slag contains about 66 lb. more phosphate than the 3 cwt. of superphosphate, and thus leaves an extra amount of residue in the soil for future crops.

The good effect of farmyard manure in all cases, and of nitrate of soda in most cases, and the effect of slag alone as compared with superphosphate alone, is shown in the table on p. 136.

On reviewing the whole of the experiments recorded here and elsewhere, it seems proved that the finely-divided slag is an efficient phosphatic manure on all classes of soils, but is more efficacious on heavy clay and on peats, and generally on soils not containing much lime. On calcareous soils it is less certain in its effects, and on these superphosphate will always have a special value. It is a more slowly-acting manure than superphosphate, and should be applied earlier. In cases where a comparatively slowly-acting manure is wanted, it has advantages over superphosphate. Usually, also, it is requisite to apply a larger quantity of the slag than of superphosphate to produce the same immediate effect, generally about 5 cwt. of slag where otherwise 3 cwt. of superphosphate would be used. At present prices these amounts of the two several manures cost nearly the same. Five or 6 cwt. of slag contains almost double as much phosphoric acid as 3 or 4 cwt. of ordinary superphosphate; and if the effects produced in the first season are the same, the dressing of slag leaves a very much larger residue of phosphoric acid in the soil, which becomes available, more or less slowly, for succeeding crops. Some experiments seem to show that the slag residues are more effective than superphosphate residues, but more evidence is wanted on this point.

In purchasing basic cinder, the farmer should obtain, not only a guarantee of the percentage of phosphates in the material, but a guarantee of the fineness of the powder, such, for example, as that 85 per cent. of it will pass through a sieve with 100 meshes to the lineal inch—*i.e.* 10,000 to the square inch—or that 75 per cent. will pass through a sieve with 120 meshes to the lineal inch. There is no immediate prospect of the cinder being adulterated with materials that would not be discovered by an ordinary analysis, as other phosphates are at the present time more expensive; but Wagner has found that different samples of basic cinder, under like conditions, act with different degrees of rapidity. Thus, some English slags were more efficient than most others, and some from Cladno, in Bohemia, acted very slowly indeed. This may be due to the different amounts of free lime and of decomposable silicates present, but requires more investigation.

The powdered slag should never be mixed with ammonium sulphate before use, as it liberates ammonia therefrom, which is thus lost. When both are used to the same crop, the slag should be applied first. It is, moreover, undesirable to mix it with kainit; or, if this be done, it should be sown at once, as the mixture is liable to cake and become hard. Owing to the great density of the slag, it is somewhat difficult to apply it evenly; it is, therefore, often advantageous to mix it first with some dry earth or similar material.

EDWARD KINCH.

AGRICULTURAL WORTHIES.

I.—THE THIRD EARL SPENCER.

With an Appended Note by the Rt. Hon. Sir Harry Verney, Bart.

IN commencing a series of papers on "Agricultural Worthies," relating more particularly to those who have been prominently connected with the Royal Agricultural Society, the first to claim attention is the eminent man whose name stands at the head of this notice, and who, *primus inter pares*, was foremost amongst those to whom we owe its inception, establishment, and early development.



EARL SPENCER.¹

Born 1782; Died 1845.

John Charles, third Earl Spencer, better known in early life by his courtesy-title, Lord Althorp, which he bore from his birth till within eleven years of his death, was born at Spencer House, St. James's, on May 30, 1782. He was educated at Harrow, and at Trinity College, Cambridge, where he took an honorary degree, as was usual at that time with persons of rank. During his first term at Cambridge he was, according to his own account, very idle; but finding that his mother had set her heart upon his being in the first class in the next college examination, he applied himself so diligently to his studies that in his second year this hope was fulfilled.

¹ This portrait is copied from the original model of Earl Spencer, taken at Althorp by the eminent Mr. William Wyon, R.A., in the year 1841. This model, from which the Smithfield Club's medal, and other medallions of Lord Spencer were taken, is now in the possession of the Society, having been presented to it in March 1890 by Mr. Leonard C. Wyon.

His college tutor was Mr. Allen, subsequently Bishop of Ely, who had graduated as seventh wrangler, and from whom he acquired a knowledge of mathematics which he frequently turned to practical account in after-life. His mind had, indeed, a mathematical bent, and his fondness for intricate calculations not only facilitated his work, and made him greatly independent of others when he attained high office as Chancellor of the Exchequer, but was manifested in various ways. It is, indeed, related as an instance of his exactitude, that on one occasion, finding an error of threepence in the accounts of the Royal Agricultural Society, he spent four hours with Colonel Challoner in setting the matter right.

In early life Lord Althorp evinced a strong inclination for the sea; but his father, though he afterwards put two of his sons into the Navy, had other views for his heir-apparent, intending that he should enter Parliament. Lord Althorp's predilections, however, were not legislative, but pastoral. From his earliest boyhood he was passionately attached to the pursuits and enjoyments of a country life, in which respect he but inherited the tastes of his father, and of still earlier progenitors. It was declared of Sir Robert Spencer, raised to the peerage by James I., that "he made the country a virtuous court, where his fields and flocks brought him more calm and happy contentment than the various and unstable dispensations of a Court can contribute"—words which are singularly applicable to the subject of this notice.¹

Lord Althorp left Cambridge on taking his M.A. degree in June, 1802, and two years later, after making the customary Continental tour, he entered Parliament as Member for the pocket borough of Okehampton. The impression which he made on his introduction into London society was (says his biographer, Sir Denis Le Marchant) "far from favourable. In person, he was neither tall nor graceful. An embarrassed manner, with a

¹ This agricultural memoir of the founder of the Society has been, from the nature of things, a compilation from many sources. Amongst the books which have been consulted in its preparation are Sir Denis Le Marchant's *Memoir of Earl Spencer* (Bentley, 1876), Charles Greville's *Diary*, the *Edinburgh Review*, Lord Brougham's *Dialogues on Instinct*, "The Druid's" *Saddle and Siroloin*, Bell's *History of Shorthorns*, Mrs. Butler's *Life of John Grey of Dilton*, the volumes of the old *Farmer's Magazine*, and other contemporary agricultural newspapers. The Editor has gratefully to acknowledge the valuable suggestions and assistance which he has received from the present Earl Spencer, the Earl of Powis, Lord Moreton, Sir Harry Verney, Mr. Albert Pell, Mr. John Thornton, Mr. John Gamble, Mr. Henry Smith, of Leamington, Mr. E. J. Powell, and from Mr. Francis Ford, but for whose skill and patience in searching books and records many of the facts and anecdotes contained in the paper would not have been brought to light.—[Ed.]

blunt and almost rustic mode of expressing himself, which a voice the reverse of melodious made more remarkable, ill-qualified him for the position he was to occupy in the brilliant coteries of Spencer House and Althorp; and his inferiority in personal accomplishments to most young men of his rank was painfully evident, even to his parents." But in spite of these disadvantages, in spite of his avowed detestation for what he called "the life of a grandee," in spite of his constant longing for those rural delights which from first to last were the chief enjoyments of his existence, he devoted himself to his Parliamentary duties with such assiduity, such singleness of purpose, and such unswerving integrity, that he gradually but surely made his way to the highest place in the confidence of his party, whilst he also secured the respect of his opponents and of the public generally by his singular freedom from the prejudices and bitterness of mere partisanship. Having been made a Lord of the Treasury when the Whigs returned to office with Lord Grenville, on the death of Pitt, in 1806, his father (then Home Secretary) induced him to offer himself for the seat vacated by this event in the representation of Cambridge University. He was unsuccessful; but in the following December he was returned at the head of the poll, after a sharp contest, for the County of Northampton, which he continued to represent until his accession to the peerage, twenty-eight years later. Though for years he but seldom addressed the House, he gradually acquired a reputation for straightforwardness and sterling good sense, and became familiarly known to politicians of all shades as "honest Jack Althorp."

In 1814, Lord Althorp married the only daughter and heiress of Mr. Acklom, of Wiseton Hall, Nottinghamshire. His union with this lady imparted to the sterling qualities of his character a devotion and enthusiasm which greatly enhanced their value and usefulness, and which never left him, save with life itself. Previous to his marriage, fond as he was of rural pursuits, it could not be said that he had taken up agriculture in earnest. Field-sports claimed the chief attention of his leisure, and the Pytchley Hounds, kept by his father and grandfather before him, furnished him with abundant occupation for eight months out of the twelve. He was in the habit of riding down from London (66 miles) after a division, and had relays of hacks placed (occasionally in stables specially built) at regular intervals along the road. He not infrequently returned to London after hunting in the same manner. Lord Althorp's eldest sister, Lady Sarah Spencer (afterwards Lady Lyttelton), writing to another member of the family on March 20, 1809,

said: "Althorp has been chiefly on the high-road between London and Northampton, flying from hunting to voting and from voting to hunting, in his usual way."

As the Master of the Pytchley he was very popular, for he spared neither time nor money in keeping up the character of the Hunt. He usually had about thirty hunters—the best that money could purchase; his men were selected without regard to expense, and the whole establishment cost him from 4,000*l.* to 5,000*l.* a year.¹ Though he maintained the reputation he had acquired at the University as a hard rider, he had but a loose seat, and met with frequent falls, dislocating his shoulder so often that he had a whipper-in instructed how to set it—an operation which the man had frequently to perform, for the joint became so liable to dislocation that it was once put out by merely throwing up the arm in leaping a fence. Lord Althorp's hunting journals, still preserved, are minutely descriptive of his runs with the hounds; and his shooting records are equally precise, giving the result of every shot that he fired, although the record is by no means flattering to his skill.

On his marriage and settlement on the Wiseton estate, consisting of some 2,000 acres, his lordship took the home farm into his own management, and, while still keeping a large stud, and maintaining his character as an eager sportsman, he also devoted close attention to agriculture and the breeding of stock. He greatly improved the property, spending some 10,000*l.* on the transformation of the Hall into a delightful home, and building not only excellent farm-houses, but also labourers' cottages, each of which he restricted to the occupation of a single family. As for his domestic happiness, Sir Denis Le Marchant says that "a more attached and united couple than Lord and Lady Althorp perhaps never existed." Even during the Parliamentary session he lost no opportunity, however brief, of returning to Wiseton. The unclouded happiness of his married life was, however, destined to be but brief, for in June, 1818, to his lasting sorrow, Lady Althorp died in London, after giving birth to a stillborn son, their first child.

It would be beyond the purpose of this narrative to notice in detail the steps which gradually led Lord Althorp, in spite of himself, to the leadership of the House of Commons, a position which he occupied during that most important period from the

¹ The present Earl Spencer writes that he has at Althorp a book in which Lord Althorp entered all the horses he bought, and how they were dealt with. On the first page of this book is a list of his yearly losses or gains by purchase and sale from the year 1803 to 1819. "He only gains," says Lord Spencer, "on the last three years."

accession to power of the Grey Administration, in November, 1830, until his elevation to the peerage on the death of his father, in November, 1834. It was with the greatest diffidence that he consented, in the spring of 1830, to undertake the leadership of the Whig Opposition; it was with still greater reluctance that, in the following November, he yielded to Lord Grey's entreaty that he would take office, and so became Chancellor of the Exchequer, with the leadership of the House of Commons.

Mr. Charles Greville, whose information is derived, through Arbuthnot, from Lord Spencer himself, states that

"when Lord Grey was sent for by King William to form an Administration, he went to Althorp, and asked him what place he would have. Althorp said he would not have any. Lord Grey said: 'If you won't take office with me, I will not undertake to form the Government, but will give it up.' 'If that's the case,' said the other, 'I must; but if I do take office, I will be Chancellor of the Exchequer, and lead the House of Commons.' 'Lead the House of Commons?' said Lord Grey; 'but you know you can't speak!' 'I know that,' he said, 'but I know I can be of more use to you in that capacity than in any other, and I will be either that or nothing.'"

In a political article contributed to the *Edinburgh Review* in 1846, the authorship of which is attributed to his colleague, Earl (then Lord John) Russell, the following passage sums up the reasons for his remarkable success:—

"The state of public affairs led him to take an active part in the House of Commons, and although no one was ever so free from the Pharisaical profession of purity, yet the simplicity of his character soon made him understood, beloved, and trusted beyond any man in that assembly. This was the more remarkable, as his tongue was far from eloquent, and, although his arguments were sound and comprehensive, he was often so wanting in words as to be obscure, and unable to convey adequately his meaning. But the confidence of his friends, his party, and the country, supplied all deficiencies, and gave to his few and simple expressions as much influence over his audience as had ever been obtained by the most admired eloquence of our greatest orators.

"He was plain in manner and in dress,¹ but a short intercourse disclosed the scholar, the gentleman, and the statesman; for he possessed, with the entire absence of all artificial politeness, the most genuine courtesy of behaviour to all who approached him. His kindness of heart shone in the most casual, as in the most cordial, intercourse; and while the intimacy of his friendship was a treasure reserved for few, the equanimity of his temper and the charity of his judgments extended to all who approached him in the conduct of affairs, or were opposed to him in political enmity. He had no

¹ Of the plainness of Lord Spencer's attire, Mr. Albert Pell gives the following amusing illustration: "The tradition is that Lord Althorp used on Saturdays to jog along to Northampton market so plainly dressed, with the samples in his pocket, that on one occasion he was addressed with undue familiarity by a stranger who overtook him. There was something in his manner, however, which puzzled his companion, and which was further increased by observing from the gap above the topboots that this plainly dressed farmer wore silk stockings. On making inquiries he found he had been on the road with the great Lord Althorp."

jealousy, no envy, and perhaps too little ambition. He often said that he had hoped the many votes he had given in favour of motions which were supported by small minorities would have prevented any proposal to him to accept office. But when he was told by Lord Grey that the formation of the Ministry depended upon his decision, he felt he could no longer hesitate."

Although Lord Althorp's first budget was, in some respects, a failure, his natural clear-headedness and sound common-sense soon made him more successful in the management of financial matters; and, in the far more difficult task of piloting the Reform Bill through Parliament, in which he had so important a share, in conjunction with Lord John Russell, his patience and candour (and complete command of temper) became conspicuously manifest. At an early period of his official life, Francis Jeffrey—then new to the House of Commons—was struck with admiration of the man, and wrote of him: "There is something to me quite delightful in his calm, clumsy, courageous, immutable probity and well-meaning, and it seems to have a charm with everybody."

On the death of his father, in November, 1834, Lord Althorp (now Earl Spencer) was called to the Upper House, and the King made use of this event as a pretext for dismissing the Ministry, on the ground that it was so much weakened as to become incapable of conducting the business of the country. But whilst this use of his elevation to the peerage caused no little vexation to Lord Spencer, his return to the quietude of private life was a source of unmixed satisfaction. It is, indeed, stated on the authority of Lord Lyttelton, that he spoke of it as "the cessation of acute pain to him."¹ He was, as a matter of course, pressed to return to office in Lord Melbourne's second Administration, in 1835; and it is said that when Lieutenant Drummond went down to Althorp on this errand, he found Lord Spencer sitting at an open window, looking at the sheep and young lambs, and he protested that nothing should induce him to leave them. No persuasion, indeed, could avail to call him back to the cares of office, for his love of the country and its pursuits was as fresh and as intense as when he was a boy at Harrow. But it is well observed by his colleague, Lord Brougham, in the introduction to his "*Dialogues on Instinct*," supposed to be carried on between himself and Lord Althorp, that "those pursuits had never interfered with the duty which

¹ In a letter addressed to his daughter, Mrs. Butler, Mr. Grey of Dilton says: "I often think of dear Lord Althorp's saying to me, when in office at the passing of the Reform Bill: 'If I were once out, they'll never catch me again. I just know every Monday morning, on coming to Downing Street, the feeling that makes a man throw himself over London Bridge!'"

he owed his country, so long as he deemed that the sacrifice of all his domestic comforts could prove serviceable to his public principles." He nevertheless availed himself of every opportunity (even after the death of his wife) to visit Wiseton, which ever held the first place in his affections and thoughts; and he never failed to spend a portion of the year there.

Having given up hunting after Lady Althorp's death, his interest in horses and dogs was transferred to cattle, and he became an enthusiastic admirer and successful breeder of Shorthorns. The story goes that the keeping of Shorthorns at Wiseton, and in the district generally, was initiated in the hunting field. The Rev. Thomas Harrison, a sporting cleric from Yorkshire, who used to hunt with the Pytchley, urged Lord Althorp, Sir Charles Knightley, and other country gentlemen whom he came across at the meets, to breed better cattle, advising them to come into Yorkshire if they wished to see what good cattle were. The result of this was a visit by Lord Althorp to Mr. Robert Colling's sale at Barmpton in 1818, when he purchased the bull "Regent" (544) and several cows. It was his lordship's boast that he had reformed his whole stock with "Regent," when that animal was condemned to the butcher as useless.

At Mr. Christopher Mason's sale at Chilton in 1829, sixteen cows and heifers were also obtained for the Wiseton herd, which became one of the largest in the kingdom, numbering about one hundred and fifty head at the time of his lordship's death in 1845. Many celebrated animals were exhibited from this herd, notably "Hecatomb," winner at York in 1838. His lordship was also a frequent winner with his Shorthorns at the Shows of the Smithfield Club, taking in 1834 and again in 1840 the Gold Medal for the best beast in the classes.

"Sweet William," "Orontes," "Wiseton" (whose portrait is given in the frontispiece of this number), and "Ranunculus" (the sire of "Belinda") were all leading bulls, and so was "Usurer," of which Lord Ducie said that "he could give shoulders to anything."

Mr. John Gamble, a noted Norfolk breeder of Shorthorns, who often visited Wiseton in Lord Althorp's time, has been kind enough to send the following interesting particulars as to some of the animals in the herd:—" 'Wiseton,' like all the herd, possessed a superior quality of flesh peculiarly their own. 'Orontes' (4623) was hard to the touch. 'Wizard' (6688) was of superior quality, and quite the type of the pure Shorthorn, a beautiful roan, the colour of 'Comet' (155). Many of the cows—especially the older ones—resembled Mason's of

Chilton, with shoulders very oblique quite into the chine, fine delicate flesh without being lumpy, most symmetrical and blood-like, with good milking qualities. 'Bon Bon' was a pretty little cow of the Sylph tribe, which was bought by Mr. Torr for Mr. Richard Chaloner of King's Fort, Ireland. Of all the herds of Shorthorns that have been bred with care, none ever did more good in the improvement of cattle for farmers' use than the Wiseton herd. What became of those which went into Devonshire I do not know. It teaches one of those lessons we too often disregard, that animals have to adapt themselves to soil and climate before they can be successfully bred upon sound principles."

In Bell's *History of Shorthorns* may be found a number of characteristic letters from Lord Althorp to that famous breeder, Mr. Thomas Bates, of Kirklevington, whom he had known for many years. In one of these, written from Dunstable in April, 1820, he thus prefaces his directions as to a cow named Rosette, and his doubts as to the future career of a certain bull-calf:—

I am on my way up to town, and as I must on getting there drive Shorthorns out of my head, to replace them by politics—certainly a more disagreeable subject, and, perhaps, in the present state of things, a less useful one—I write you a parting letter, &c.

Another, written in December of the same year, commences with the gratifying assurance that "His Grace's cough is nearly well," and ends with the hope that "Earl Percy is well and thriving." Hecatomb, which took the prize awarded for the best bull in the yard at the meeting of the Yorkshire Society held at York in 1838, beat Mr. Bates's famous bull, Duke of Northumberland, then a two-year-old, for which his owner is stated to have refused an offer of 4,000 guineas. This was the only occasion on which that famous animal, which created such a sensation when exhibited at the first show of the English Agricultural Society, held at Oxford, in 1839, was defeated in the show-yard, and Mr. Bates never forgot or forgave the award, which was made by Mr. John Grey of Dilston and two colleagues.

The Wiseton herd was bequeathed by Earl Spencer in his will to his steward, Mr. John Hall,¹ and a large portion of it was sold in 1846, the year after his lordship's death, 117 animals

¹ Mr. Hall was a foundation member of the Royal Agricultural Society, and survived until January 1869, when he died at the age of eighty-six. In early days he was in great request as a judge of Shorthorns. His portrait appears in the frontispiece of this number, as well as in the large picture, "The Country Meeting of the Royal Agricultural Society."

averaging about 45*l.* each. The entire remainder, including the produce bred by Mr. Hall, came to the hammer on April 28, 1848. Eighty-eight animals averaged 65*l.* 5*s.* apiece, Usurer being purchased by Earl Ducie for 400 guineas, another bull realising 370 guineas, and some of the cows 200 guineas each. That the Wiseton herd had a great reputation may be inferred from the fact that the bull "Firby" and two cows were illustrated, as specimens of the Shorthorn breed, in Youatt's Book on Cattle; and that the portraits of several other Wiseton animals were given in the early volumes of Coates's *Herd-book*.

At no time—even when his cares as Chancellor of the Exchequer were most absorbing—did Lord Spencer's interest in his farm languish, and the first letters opened in the morning were those which he received from his bailiff at Wiseton.

John Grey of Dilston, when he called on Lord Althorp in Downing Street, during the most arduous part of his official career, interviewing the great man's Cerberus as a preliminary, was told: "You've come about cows, sir, so you'll not have to wait long." Having been ushered into the presence, his lordship "shut the door, looked round to see if they were alone, and then, before uttering a word on the political crisis in which they were so deeply interested, he asked, eagerly: 'Have you been to Wiseton on your way up? Have you seen the cows?'" Every Monday morning, his lordship received the most accurate budget of what cows had calved during the week, with the calf-marks, and he did very little work till it was all transcribed into his private herd-book. On this particular morning he handed Mr. Grey a letter, saying, "There's a letter from Carnegie; he admires my political course, and he writes from the Lothians to say that I shall have the first refusal of his bull." Then he characteristically added: "I've written to thank him for his political confidence, but I've told him that there is a flaw in his bull's pedigree. He traces him back to Red Rose, but Red Rose never had a heifer-calf."

Sir Denis Le Marchant records the fact that when, one Easter vacation, his lordship was utterly exhausted by the debates on the Reform Bill, and was ordered off to Nottinghamshire by his physician, he (Sir Denis) called on his secretary, Lieutenant Drummond, a few days later, anxious to learn what accounts had been received, whereupon he was handed the following characteristic note:—

DEAR DRUMMOND,—I bore the journey well, and already feel much better. I am just returned from seeing the finest yearling ox I ever saw in my life.—Yours truly,

ALTHORP.

We learn from another anecdote connected with this period,

that in preparing the second Reform Bill the question of disfranchisement was made to depend upon a joint ratio of the population of the borough and the amount of taxation, and to facilitate the calculation of this ratio Lieutenant Drummond prepared a scale, which was adopted by the Government.

It happened (continues the story, which is authenticated by Lord Belper) that about the time of the hottest contests on the Reform Bill Lord Althorp had occasion to receive at his office a deputation of Scotch Members and others, amongst whom was Mr. T. F. Kennedy, then M.P. for Ayr, who was an intimate friend of Lord Althorp, and, like him, much interested in agricultural pursuits. When the deputation was leaving the room on the conclusion of their business, Lord Althorp called Mr. Kennedy back, and said: "I want to tell you what I have been doing. I have been applying Drummond's scale to my sheep;" and he then produced a list of sheep, carefully arranged in order according to a calculation founded on the joint ratio of some two qualities of the animal which he considered of primary importance.

It is not impossible that the jaded Minister may have shared to some extent the feeling of the witty statesman who once defined a deputation as "a noun of multitude that signifies many, but does not signify much."

It is also stated by Lord Cockburn, in his "Memoirs of Lord Jeffrey," that when, in 1832, Ministers resigned office, to be recalled a few days later, Lord Althorp was to be found, not plotting for a return to power, but spending his time in some nursery-grounds, choosing and buying flowers, of which he took home five large packages in his carriage, to be planted at Althorp.

Lord Spencer's biographer quotes an interesting letter from Mrs. Butler, who states that the packets of Lord Spencer's letters still in her possession are labelled "Bulls," "Sheep," &c., and that by looking through these "one may dimly identify his favourites, Cheviot, Flodden, Hector, Rhadamanthus, &c., by certain spots on the side of the nose, or the beautiful straightness of the back, or the snowy whiteness of the hide." These were the matters which interested Lord Althorp, even when burdened with the weighty affairs of State; and one cannot but admire the calm and placid temperament which enabled him, when opportunity offered, to cast these aside, and seek repose for body and mind amid scenes and pursuits more congenial to his tastes.

The picture by Richard Ansdell, "A Scene at Wiseton," which has been reproduced as the frontispiece of the present number, illustrates very well the daily life of Lord Spencer in his country home. He is evidently discussing with Mr. J. Elliott, the steward of his estates at Althorp, and his steward at Wiseton, Mr. Hall (who is standing in the foreground, note-

book in hand), the merits of his favourite bull "Wiseton," which is led by his herdsman John Wagstaff, arrayed in the flower-pot hat of the period. The date of the picture is a little uncertain; but it was evidently some time early in the forties, as Ansdell was then engaged in painting the portraits of the leading agriculturists of the time for his great picture, "The Country Meeting of the Royal Agricultural Society," the engraving of which appeared in 1845. In that picture Lord Spencer appears in precisely the same attitude as in the frontispiece—with his hands in his pockets, his dog "Bruce" by his side, and attired in the identical cutaway coat, breeches and gaiters, as in the "Scene at Wiseton." In the picture of the Society, Lord Spencer is the centre of a group which includes on the right the Duke of Sutherland, the Marquis of Exeter, the Hon. Capt. Spencer, R.N. (afterwards fourth Earl), and the Earl of Leicester, and on the left the Marquis of Downshire, Mr. Henry Handley, Col. Challoner, the Duke of Richmond, the Earl of Hardwicke, the Duke of Northumberland, H.R.H. the Duke of Cambridge, and the Duke of Beaufort.¹

It has been necessary to dwell at some length—though not, it is hoped, with undue minuteness—on the varied phases of Lord Spencer's career, in order that the reader may the better understand what manner of man it was who, at the very time when he was unhesitatingly refusing such important posts as the Lord-Lieutenancy of Ireland and the Governor-Generalship of Canada—both of which were offered to him by Lord Melbourne in November, 1838—preferred to devote his best energies and his great influence to the consolidation of the Royal Agricultural Society, which in the earlier part of the year he had been so instrumental in establishing.

On important occasions Lord Spencer was to be found in his place in Parliament. He was also assiduous in his attention to the various duties pertaining to his high position, as Chairman of Quarter Sessions, as a patron of the Northampton Infirmary and kindred local institutions, and in other ways. But the real pursuit of his later years was agriculture, and the maintenance and en-

¹ It may be interesting to add that this picture contains the portraits of 126 of the leading agriculturists of the day, including four who happily still survive:—The Earl of Burlington (now the octogenarian Duke of Devonshire), the Earl of Lovelace, Mr. J. Wilson-Patten, M.P.—on horseback (now Lord Winmarleigh); and Dr. (now Sir Lyon) Playfair, the latter in a group comprising the great German chemist Liebig, the Earl of Ducie, and his agent Mr. Morton (father of the late Mr. J. Chalmers Morton). Copies of this engraving are now rare, and copies of the Key still rarer. The Secretary of the Society has had the office-copy of the Key reproduced in fac-simile, and copies may be had of this reprint at 12 Hanover Square.

couragement of associations connected therewith, and especially of the Royal Agricultural Society.

"The Royal" was not, however, the first society to enjoy the great advantage of his guidance and support. He was one of the founders of the Yorkshire Agricultural Society; and in 1825, when the Smithfield Club had been for three or four years without a head, and seemed to be on the point of dissolution, Lord Spencer consented to become its president, and set himself to retrieve its fortunes, with such success that in 1831 a splendid candelabrum of the value of 200 guineas was presented to him, in testimony of "his valuable services in raising the Association to its present eminence." It was, indeed, at the annual dinner of the Smithfield Club, of which he remained president till his death, that on December 11, 1837, he first publicly mooted his project for establishing the society known at first as the English Agricultural Society. Sir Brandreth Gibbs states, in his "*History of the Smithfield Club*," that three days earlier Mr. Wm. Shaw, who afterwards became the first secretary to the Society, met Lord Spencer and Mr. Humphrey Gibbs, Honorary Secretary to the Club, in the Club-parlour in Goswell Street, and that it was then determined to bring the matter forward at the dinner, if the co-operation of the Duke of Richmond could be obtained. This was readily promised; for though his Grace and Lord Spencer were opposed in politics, they were of one mind in everything that concerned agriculture, and it was afterwards (as Mr. Grey of Dilston observed in one of his letters) a cheering sight to see them walking in to dinner together at the annual meetings.

The time and place selected for Earl Spencer's public announcement of his scheme were as felicitous as its exponent was influential, and his lordship's proposal was received with acclamation by one of the largest assemblages ever seen at the Smithfield Club dinner. The Duke of Richmond was prompt in his support, and was followed by Mr. Handley and several others, so unhesitating in their concurrence that success was well-nigh assured. A voluminous correspondence ensued between Lord Spencer and his friends, in which the Duke of Richmond, the present Earl Grey, Mr. Philip Pusey, M.P., Mr. Handley, M.P., Mr. John Grey of Dilston, and others, took part. The last-named spoke, years afterwards, of "the bulky correspondence" he had had with Lord Spencer and others on the subject; but, unfortunately, this correspondence was subsequently destroyed.

The time was ripe for the formation of an institution for the general advancement of agriculture, which had not received the national attention which it deserved, and many able, good

men—such as Handley, R. Clive, Estcourt, Childers, and Philip Pusey—were ready to lend their aid; but it required two such leaders as Lord Spencer and the Duke of Richmond to bring together the memorable gathering that assembled at the Freemasons' Tavern on May 9, 1838, to establish the English Agricultural Society. As a matter of course, Lord Spencer was called to the chair, and set forth the object of the meeting without any attempt at rhetorical display, urging upon those around him the necessity there was for the wider and more general diffusion of agricultural knowledge, and pointing out how this might be effected by the establishment of a great and powerful society combining practice with science—an expression which is perpetuated in the Society's motto. He also pointed out, in plain and forcible language, the necessity for excluding politics from the Society's operations, and thus laid down the governing principles which have regulated its proceedings, ensured its prosperity, and guided to practical usefulness the scientific operations which it has initiated or encouraged.

It is unnecessary to follow Lord Spencer through the various stages of his work as the first President of the English Agricultural Society. His labours were constant and unremitting, and at the General Meeting held in the following December, the "marked thanks" of the Society were voted to him for his eminent services. At the first Annual Meeting, in May, 1839, his lordship was in a position to announce that 1,100 members had been enrolled, and that the invested capital amounted to 3,000*l.*, in addition to 1,196*l.* in the bankers' hands. Two months later he had the satisfaction of attending the first Country Meeting, held at Oxford, and of witnessing the extraordinary excitement which that event occasioned, and the enthusiasm manifested at the dinner in the quadrangle of Queen's College. It was at this dinner that Daniel Webster, the American orator and statesman, responding most eloquently to the toast of "Distinguished Strangers," uttered the memorable aphorism: "Agriculture feeds us: to a great degree it clothes us: without it we could not have manufactures, and we should not have commerce. These all stand together; but they stand together like pillars in a cluster, the largest in the centre—and that largest is Agriculture."

At Cambridge in 1840, Liverpool in 1841, Bristol in 1842, and Derby in 1843, Lord Spencer participated actively in the proceedings. In 1844, when the Country Meeting was held at Southampton, he again occupied the Presidential Chair, and in the same year gave his valuable co-operation in the establishment of the Royal Agricultural College at Cirencester. At the

Shrewsbury Show, held in 1845, with the Duke of Richmond as President for the second time, no one worked harder than Lord Spencer in putting the stock into their proper stalls. Indeed he would often, at the Smithfield Club or at the "Royal" Meetings, work the whole day in his shirt sleeves. In connection with the Shrewsbury Show another peculiarity of his lordship came to the front. In the early days of the Society it was the custom to have immense annual dinners of the members, at which an infinite variety of loyal patriotic and agricultural toasts were proposed. The Shrewsbury dinner took place in a pavilion erected in the Quarry Walks, near St. Chad's Church, and was attended by about twelve hundred guests. The present Earl of Powis, who, as Lord Clive, was present at this dinner, and was entrusted with the toast of the health of Lord Portman, the President-Elect, says that "Lord Spencer, notwithstanding his prominence as the chief founder of the Society, never sat at the high table, but at the top of the centre ordinary table, under the President, and that he used to stand either on his chair or on the table when he spoke." The toast which Lord Spencer had to propose was "Agriculture, Manufactures, and Commerce," and for the more effectual delivery of it he mounted on the table. Lord Powis says that "just as he began his speech the church bell commenced tolling. The personal exertions of the Mayor were necessary to stop it, and when he had returned, and the interruption had ceased, Lord Spencer resumed his speech, saying that he had often heard of the beauty of the Shropshire *belles*, but he had not been before aware that they were so loquacious!" During the interval his lordship, with the utmost good humour, kept his place upon the table, "appearing," says the *Farmer's Magazine*, "heartily to enjoy the ludicrous nature of his position, whilst shouts of laughter and bursts of applause alternately occupied the time."

The Shrewsbury Show, which was the last held in a town without railway communication, was also the last that Lord Spencer attended, for his useful life was shortly afterwards brought to a close. At the Country Meetings he always took a prominent part; but the services rendered by him in the Council-room, and in other ways, were not less important, though their value could only be adequately estimated by those who acted as his colleagues. He was also an occasional contributor to the Society's Journal, and stimulated others to supply it with communications of interest. In one of his papers he gives an interesting account of the great improvements effected in West Norfolk by that pioneer of agricultural progress, Lord Leicester; in another he deals com-

paratively with the feeding properties of mangel-wurzel and Swedish turnips; and in others he applies to such matters as the breeding of stock and the gestation of cows that aptitude for intricate calculations which has been already alluded to. Indeed, his biographer states that at one time this inclination very nearly induced him to go on the Turf, and he attended a few meetings at Newmarket; but his interest in racing soon became confined to entertaining an annual party at Wiseton for the Doncaster week, when it was not unusual for visitors to strike a bargain with their host for the next calf of any cow to which they took a fancy.

It was on one of these occasions, in the autumn of 1845, that Lord Spencer was seized with an illness which shortly afterwards proved fatal. Being for the first time a steward of Doncaster Races, with Lord George Bentinck for his colleague, Lord Spencer took lodgings in the town, and it was here that he was seized with indisposition; but he did not allow this to prevent him from joining his guests at dinner in the evening. Gradually, however, the attack assumed a much more serious aspect, and though he afterwards rallied sufficiently to bear being moved to Wiseton, a rapid change for the worse soon rendered his condition so alarming that he gave up all hope of recovery, the sudden collapse of his physical powers being attributed to weakness arising from his habitual abstinence from food through fear of his hereditary enemy, the gout.

Lord Spencer breathed his last early in the morning of October 1, and the Council of the Royal Agricultural Society, in recording the severe loss it had sustained, expressed "their deep sense of his private virtues, and of the valuable services he had so uniformly and unweariedly rendered to the Society in promoting every practical object connected with its welfare and the general advancement of agricultural improvement." His position as one of the Trustees was taken by his brother, and successor in the title, the father of the present Earl; and the vacancy on the Council thus created was appropriately filled by the election of his old friend and colleague, Mr. John Grey of Dilston.

This notice of one whom the members of the Royal Agricultural Society must always regard with reverence, cannot be better closed than by subjoining some extracts from Mr. Charles Greville's masterly estimate of Lord Spencer's character, written by that keen observer of men and manners within a month of Lord Spencer's lamented death:—

He was the very model and type of an English gentleman, filling with propriety the station in which fortune had placed him, and making the best use of the abilities which Nature had bestowed upon him. Modest without

diffidence, confident without vanity, ardently desiring the good of his country, without the slightest personal ambition, he took that part in public affairs which his station and his opinions prompted, and he marched through the mazes of politics with that straightforward bravery which was the result of sincerity, singleness of purpose, the absence of all selfishness, and a true, genuine, but unpretending patriotism. His tastes, habits, and turn of mind were peculiarly and essentially English; he was a high-minded, unaffected, sensible, well-educated English gentleman, addicted to all those rural pursuits and amusements which are considered national; a practical farmer, and fond of field sports, but enjoying all things in moderation, and making every other occupation subordinate to the discharge of those duties to his country, whether general or local, the paramount obligation of which was ever uppermost in his mind. His friends followed this plain and simple man with enthusiastic devotion, and he possessed the faculty of disarming his political antagonists of all bitterness and animosity towards him. He was regarded in the House of Commons with sentiments akin to those of personal affection, with a boundless confidence, and a universal esteem. Such was the irresistible ascendancy of truth, sincerity, and honour, of a probity free from every taint of interest, of mere character unaided by the arts which captivate or subjugate mankind.

Note by Sir Harry Verney.

I HAVE been asked to give a few personal recollections of the first President whom we elected as head of the Society which has proved to be so helpful and efficient a promoter of science, as applied to agricultural practice, throughout the whole kingdom.

As the "Father" of the Society, now that both Lord Eversley and Lord Portman are dead, I am one of the few links between the first half-century of its existence and the inauguration of what we may venture to hope will be a second period of still greater usefulness, now that the necessity of the adaptation of science to the workaday uses of the present is seen to be of vital importance to our position as a nation in the world.

Lord Althorp was an example, the most remarkable I can recollect during the fifty-four years of my Parliamentary life, of the power and influence which character alone gives. He had no commanding abilities, nor the gift of eloquence, to which such an inordinate value is now attached, and his position was honourable, both to him and to us of the House of that day. In his most earnest addresses to us there was never a burst of fervid feeling. His hearers could not help being impressed by his appeals, but it was from their conscientious truthfulness and perfect simplicity; everyone knew that he told without disguise exactly what he wanted, and why he wanted it. With some Ministers there is a feeling that they are bringing forward the thin end of the wedge—a measure to establish a principle which will help on some other object which they keep in the background. We all, Tories, Whigs, Radicals alike, knew that if Lord Althorp

had had any ulterior intention in view, he would have told us; his language was always outspoken and transparently truthful. At the same time, though his speeches were never eloquent and never long, I do not agree with Lord John Russell that they were obscure. Sitting among the young members of his party, I may say that we never for a moment missed his meaning, or did not follow the gist of his argument.

As Leader of the House, his courtesy was such that no member, however distasteful to his audience his speech might be, could ever complain that he had not been listened to, or had been treated ungraciously. In the long and often weary debates, we knew how much happier our Leader would have been discussing the points of a fat ox, or the merits of turnips and mangels as the best material for making most beef and mutton in the shortest time; but he never for a moment lost his patience with the bores. At that time there were several clever and amusing speakers in the House. What has become of them and their speeches? Even the names of the speakers are now forgotten; they were men of no character. In the intervals of debate, when I wanted some explanation or information, he would allow me to go and sit by him, and seemed gratified to satisfy an honest desire to know the why and wherefore, telling me all he knew in the kindest and most agreeable fashion. He was the most open and generous of opponents, and never concealed anything that might make against his own views, so that he often anticipated a speech which would have been uttered against him, and his adversary would observe, "He has taken my speech out of my mouth."

He always showed the utmost consideration for those who differed from him, and being as he was the Leader of the House during the difficult and aggravating questions concerning the Reform Bill, when the loss of the rotten boroughs was arming against it the owners of such property on both sides of the House—when fierce and bitter was the wrath poured out in full vials on the measure night after night, though not on him personally—Lord Althorp never faltered in the smallest degree. He and Lord John and their colleagues had made up their minds that the Reform Bill was a measure for the welfare of the country, and the principle of the representation of the people compelled the abolition of these boroughs.

There are a few sentences of autobiography by Lord Spencer in the first pages of Sir Denis Le Marchant's memoir which are very interesting: "I have long known and often endeavoured to impress upon my mind that there is only one object worthy the ambition of a man of sense, and that is to obtain the favour of

God. . . . I retire from political life from my own inclination, but it is satisfactory to me firmly to believe and to be convinced that by so doing I give myself greater facilities to become a religious man than I should have possessed had I continued in the new situation where I was placed." Mr. Grey of Dilton writes: "Above all, Lord Spencer's opinions upon questions, both speculative and practical, were guided by a humble reliance on the goodness of God, and that he was bound in whatever he might think or do, whether in following or resisting his own inclination, to obey the law of Christ." Jeffrey calls him "Lord Althorp, that most frank, true, and stout-hearted of God's creatures." Such testimony will be read with satisfaction by those who think that Lord Althorp's religious convictions gave to his principles that which nothing else could impart. The successful statesman, the eminent agriculturist, is more trustworthy if his duties are carried out in the world with the consciousness that he does them under the eye of God.

The absolute trust in him felt by the House was very touching. I was present when a matter was suddenly brought before the House which was to have been debated several nights before. There was a long and brilliant speech by Croker, when Lord Althorp got up and said he had gone into the subject fully in preparation for the previous debate, and that, although he had now forgotten the arguments which convinced him, he hoped the House would trust him when he said that he was quite certain of the rightfulness of the course which he asked them to take; and the proposal was carried through at once! I do not recollect ever to have heard of such confidence shown to any other Minister; it was the union of his robust common-sense and the perfect fairness of the way in which he treated the other side of the question which could alone have given him such power. "He was the straightest man in England," as was once said of Forster.

On one night alone did I hear anything approaching a fervid burst of speech from him, and that was in a debate on slavery. I had just before returned from the Brazils, where I had seen it in all its horrors—in the slave ship, where the dead were lying side by side with the living, till they could be thrown overboard secretly at night in the harbour of Rio; and up country, where the slave-driver might, and did, practise any amount of cruelty. Lord Althorp spoke as one who felt strongly with Wilberforce, Clarkson, and the anti-slavery party, who were working the cause of humanity at that time under great obloquy.

It must never be forgotten that his public career as Leader of the House, and Chancellor of the Exchequer, only lasted from

1830 to 1834, when the death of his father removed him to the Upper House. How important his position in the Government was felt to be appears from the fact that William IV. took advantage of his quitting the House of Commons to dismiss the Ministry, saying that it could not possibly stand without Lord Althorp. This was a mere pretext, and Lord Grey made great efforts to induce Lord Spencer to accept some office as a peer, but he declined.

His father's imprudent expenditure had left the Althorp estate very poor, and threw a quantity of unavoidable business upon his hands. He continued to live quietly in the country at a small estate belonging to his wife (Wiseton), and devoted himself to his agricultural pursuits and to country business for the next ten years, when he died rather suddenly.

The dress of that day was not a very becoming one—the blue and buff, the shorts and gaiters; but his absence of pretension, his simplicity, gave him the unmistakable look which we like to think characteristic of a thorough Englishman.

His speeches were never bitter, and never elicited a bitter reply. His look and manner during their delivery were so calm that a stranger might think them unimpressive, but the oftener you heard him the more you felt how much they contained, the subjects having been thought over, and his opinions expressed so decidedly and firmly, that no one could reply with any idea of inducing him to change his mind.

The complete unselfishness, the absence indeed of any sort of self-seeking, or even natural ambition, was one source of the extraordinary influence which he exercised. The honour and the honesty which shone through every thought of his heart and every action of his life, with no adventitious gifts of any kind to enable him to succeed, were what gave him his power over the House and the nation, one never possessed even by men of such brilliant abilities as Canning and the Pitts, and I must say as creditable to the England of that day, whether in or out of the House, as it was to the man who inspired such enthusiastic affection.

The Editor has sent me his sketch of Lord Spencer, and I have much pleasure in saying, after looking through the article, that I quite concur in all that he says of Lord Spencer's peculiar qualifications as the founder of the Society. He was a highly educated man, a trusted political leader, a thorough sportsman—riding sometimes sixty miles to cover; but his taste for agricultural life was the background of his character. This is plainly told in the Editor's article, which faithfully describes our founder and first President.

HARRY VERNEY.

Official Reports.

REPORT OF THE COUNCIL

*To the Half-Yearly General Meeting of Governors and Members,
held at 12 Hanover Square, on Thursday, December 12, 1889.*

THE Council are glad to be able to announce that the second half-century of the Society's corporate existence will open with every indication of increased prosperity. During the year of presidency of Her Majesty the Queen the number of new Members elected was 2,762—an accession of support as gratifying as it is unprecedented.

2. Since the General Meeting held on May 22 last, a total of 4 new Governors and 578 new Members have joined the Society. The addresses of 24 Members who were not included in the total at the time of the last Report have since been found, and they are now re-instated on the effective list. On the other hand, 2 Governors and 138 Members have died, and 189 Members have resigned, whilst 81 Members whose present addresses have not been communicated to the Society have been struck off the Register under Bye-law 10, and 174 more have been struck off, under Bye-law 11, for the non-payment of their subscriptions. The names of many of the Members thus struck off have remained on the books for a considerable period since the last exercise of their privileges of Members, but are now expunged in order to a more accurate statement of the number of effective subscribers.

3. The Society at present consists of—

70 Life Governors,
61 Annual Governors,
3,728 Life Members,
7,022 Annual Members,
16 Honorary Members ;

making a total of 10,897 Governors and Members, or a net increase of 31 since the General Meeting in May.

4. During the last half-year the Council have had to deplore the loss by death of two of their colleagues—the Hon. Edward Coke and Mr. W. H. Wakefield. Mr. Coke had been a Member of the Council since 1883, and was well known as one of the leading

breeders of Shire-horses. In Mr. Wakefield the Council have lost a prominent and energetic Member, and his painfully sudden death on the 8th ult. from heart-disease, whilst in the hunting-field, was a great shock to his colleagues and fellow-workers. Only two days before his death he had been present at the monthly meeting of the Council, and had taken, as was his wont, a leading part in the proceedings. Mr. Wakefield was elected a Member of Council at the General Meeting held on May 22, 1871, and was appointed a Vice-President on November 3, 1886, in the room of the late Sir Edward Kerrison, Bart. He was first elected a Steward of Live-stock for the Hull Meeting of 1873, and retired as Senior Steward after the Birmingham Meeting of 1876. He was again nominated as Steward of Stock for the Norwich Meeting of 1886, and it thus fell to his lot to be Senior Steward at the historic Windsor Meeting in the present year.

5. A vacancy in the list of Trustees occurred in May through the resignation of the Earl of Lichfield, in consequence of his inability to resume any active part in the Society's work. This vacancy has been filled by the election as Trustee of the Duke of Bedford, and that caused through the death of Mr. William Wells by the election of Sir Matthew White Ridley, Bart., M.P.

6. Sir John H. Thorold, Bart., and Mr. Walter Gilbey have been elected Vice-Presidents of the Society in succession to the Duke of Bedford and Sir Matthew Ridley; and the vacancy in the list of Vice-Presidents caused by the death of Mr. Wakefield has been filled by the election of the Rt. Hon. Henry Chaplin, M.P.

7. To replace the three Members of the Council who were ineligible for re-election through not having attended the meetings the number of times required under Bye-law 23, Mr. Samuel Rowlandson, Mr. Garrett Taylor, and Mr. Christopher W. Wilson, were elected at the Anniversary General Meeting held on May 22. The vacancies in the Council caused by the election of Sir John Thorold and Mr. Gilbey as Vice-Presidents, and by the death of the Hon. Edward Coke, have been filled by the election of H.R.H. Prince Christian of Schleswig-Holstein, K.G., the Marquis of Tavistock, and Mr. Dan. Pidgeon.

8. In accordance with the new arrangements described in the last Report of the Council, the presentation of a complete balance-sheet of the Society's accounts will in future be made annually to December 31. The Society's Auditors have, however, examined and passed the Statement of Receipts and Expenditure to June 30 last, and they have also provisionally audited the accounts for the Windsor Meeting. The Society undertook this year certain works of road-making, extra water-supply, levelling, and restoration of the ground after the Show, which are usually borne by the Local Committee; and as some of these works are not yet completely settled for, it has been found impracticable to finally close the accounts of the Meeting until the end of the year. The nearest estimate possible of the

accounts now outstanding shows that the Meeting has resulted in an excess of expenditure over direct receipts of about 4,900*l*.

9. That the Windsor Meeting was not likely to result in an absolute profit to the Society was recognised by the Council from the first ; and the dimensions which the Show assumed when the entries were found to be so unprecedentedly large, necessarily involved the Society in expenditure which it was impossible that the entry fees and the payments for the admission of non-members should recoup. The Show being considerably more than twice as large as usual, all the attendant expenses for shedding, fodder, printing, Judges' fees, administrative staff, wages, police, and the like, were necessarily increased in proportion, whilst, on the other hand, not much beyond the average attendance of paying visitors could be looked for. The prizes offered were, moreover, much more valuable and numerous than customary.

10. The Council do not doubt, however, that the general body of Members will agree with them in thinking that the Society's funds have been well spent in bringing together, for the fitting celebration of its Jubilee, an assemblage of British live-stock, implements, and produce, of unparalleled magnitude and importance. The recent large accession of new Members will enable the Society to bear the loss on the Windsor Show without undue strain upon its resources ; and there can be no doubt that the Show did much to stimulate the interest of agriculturists generally in the operations of the Society.

11. Honoured by the patronage and presence on no less than four occasions of Her Majesty the Queen as President, and also of His Royal Highness the Prince of Wales and the other members of the Royal family, and favoured by brilliant weather, the Meeting was, indeed, a great and conspicuous success from first to last. Her Majesty the Queen's approval of the efforts of the Society to make its fiftieth country meeting worthy of the occasion, is testified by her gracious bestowal of the dignity of a Knighthood upon the Honorary Director, Sir Jacob Wilson, and by the following letter, written in Her Majesty's own hand, immediately after the close of the Meeting :—

Windsor Castle : July 2, 1889.

It gave me very great pleasure to visit the Show of the Agricultural Society, of which I am this year the President, and I can assure you that I was extremely gratified with this magnificent Exhibition.

I must thank the Council for the care and attention they have devoted to this work, which has been so successful, and I am especially anxious to convey my acknowledgments to Sir Jacob Wilson and Mr. Ernest Clarke for their exertions in organising this Show.

(Signed) VICTORIA R.I.

To the Council of the Royal Agricultural Society of England.

12. At the Fiftieth Annual Meeting of Governors and Members, held in the Show-yard on Tuesday, June 25, H.R.H. the Prince of Wales, Acting-President, in the Chair the following resolution,

moved by the Duke of Richmond and Gordon, was carried by acclamation, and is inserted in this Report for purposes of record :—

The Royal Agricultural Society of England, in General Meeting assembled, desires, with every feeling of loyal attachment, to express to Her Majesty the Queen its grateful sense of the honour and benefit conferred by Her Majesty's gracious condescension in the acceptance, during its Jubilee year, of the position of President of the Society.

By this act Her Majesty has shown in the most direct manner the great interest which she feels in one of the most important industries in Her Majesty's dominions. This must be a great incentive to those engaged in agriculture to continue their efforts to meet the depression under which that industry has for so long been unhappily suffering.

The Society, at the close of Her Majesty's year of office, desires once more to assure Her Majesty that there is no class of her subjects more devotedly attached to Her Majesty than the agriculturists of England.

At the same Meeting, special Gold Medals, which had been struck by order of the Council in commemoration of Her Majesty's year of presidency, were presented to the Prince of Wales by the Duke of Richmond in the name of the Society, for the acceptance of Her Majesty the Queen and of His Royal Highness.

13. The enthusiasm with which the Members of the Society and the agriculturists of the country generally rallied to the celebration of the Society's Jubilee was highly gratifying. The Council were specially favoured by the presence, in response to their invitation, of Lord Polwarth (president), Sir James Gibson Craig, Bart., Mr. James MacQueen, and Mr. F. N. Menzies (secretary), representing the Highland and Agricultural Society of Scotland; and of the Earl of Rosse (president), the Baron de Robeck, D.L., Mr. S. Ussher Roberts, C.B., and Mr. C. Uniacke Townshend (hon. secretary), representing the Royal Dublin Society.

14. The Council have decided that the Plymouth Meeting shall commence on Monday, June 23, 1890, and close on the following Friday evening. The Implement Yard and the Working Dairy will be open to Members of the Society and the public on the previous Saturday, June 21. The last day for making entries in the Implement Department will be Tuesday, April 1; but post-entries, of Agricultural Implements only, will be received up to Saturday, April 5. For Stock, Poultry, and Produce, the entries will close on Thursday, May 1, with post-entries at double fees up to Monday, May 12.¹

15. The following Prizes for Implements and Dairy Appliances will be offered in connection with the Plymouth Meeting :—

Class	First Prize	Second Prize
1. Light Portable Motors, steam or other, up to five brake-horse-power.		
(a) Motors using Solid Fuel (including Steam Engines and Hot-Air Engines)	£30	£20
(b) Motors using Liquid or Gaseous Fuel	£30	£20

¹ For complete Prize Sheet, including Prizes subsequently offered, see pages xx to xxiv of Appendix.

Class	First Prize	Second Prize
2. Grist Mills for use on a farm, to be worked by an Engine not exceeding ten brake-horse-power	£20	£10
3. Disintegrators, suitable for working with a Portable or Traction Engine not exceeding twenty brake-horse-power	£20	£10
4. Plant for Cider-making, suitable for use on a farm	£20	£10
5. Strong Dairy Thermometer, with broad Mercury Column, to float upright in milk or cream at about 40° Fahr., and to be scaled in a very bold, clear manner from 40° to 120° Fahr.	£1	—
6. Collection of non-returnable parcel-post boxes to carry from 1 lb. to 5 lb. of butter	£2	£1
7. Collection of non-returnable parcel-post boxes to carry from 5 lb. to 10 lb. of butter	£2	£1
8. Vessel to contain preserved butter, closed hermetically without the use of solder	£2	—
9. Sieve or Sile for use in a dairy	£1	—

16. The Society will offer at Plymouth Prizes for Hunters, Coach Horses, Hackneys, Ponies, Shire, Clydesdale, and Suffolk Horses for breeding purposes; and the Plymouth Local Committee will add Prizes for Hunter, Hackney, and Pony Mares or Geldings, and for Agricultural Horses not qualified to compete as Shires, Clydesdales, or Suffolks, adapted for a hilly country. Prizes are also offered by the Devon County Agricultural Association for Dartmoor and Exmoor Ponies, by the Hackney Horse Society for Hackney Stallions foaled in 1888, and by the Suffolk Stud Book Association for Yearling Stallions and Fillies of the Suffolk breed. The Shire Horse Society also offer Champion Prizes for the best Shire Stallion and for the best Shire Mare or Filly.

17. In the Cattle Classes, Prizes will be offered by the Society for Shorthorns, Herefords, Devons, Sussex, Welsh, Red-Polled, Jerseys, and Guernseys, and for Dairy Cattle giving the greatest quantity of milk containing not less than 12 per cent. of solids and 3 per cent. butter-fat. The Plymouth Local Committee will give Prizes for Kerry and Dexter Kerry Cattle, and the Devon County Agricultural Association will add Prizes for South Devon Cattle.

18. Prizes will be given by the Society for the following breeds of Sheep:—Leicester, Cotswold, Lincoln, Oxford Down, Shropshire, Southdown, Hampshire Down, Suffolk, Somerset and Dorset Horned, Devon Long Wool, Dartmoor, and Exmoor. The Devon County Agricultural Association will give similar Prizes for South Devon Sheep, and the Plymouth Local Committee will give Prizes for Wool of the clip of 1889—to be shown in the grease—from sheep of the following breeds:—Devon Long Wool, Dartmoor, Exmoor, and South Devon. Prizes will be given by the Society for Large White, Middle White, Small White, Berkshire, Black, and Tamworth Pigs, and for useful descriptions of Poultry.

19. Prizes will be given in six classes for Cheese, and in five classes for Butter, including one for Butter made from scalded

cream, offered by the Plymouth Local Committee. Five Prizes of 5*l.* each, and five Prizes of 3*l.* each, will be given for Fresh Butter, Fresh Butter slightly salted, and Butter made from scalded cream. Prizes will also be given for Cider and Perry, and for Jams and Preserved Fruits made in 1889. The British Bee-Keepers' Association will continue their Prizes for Hives, Honey, and Bee-Appliances.

20. The Butter-making Competitions, which the Council believe to have been of material benefit during the past few years in inculcating the improved principles of dairying, will be continued at Plymouth. The following classes have been arranged, five Prizes being offered in each class:—(1) *Tuesday, June 24.*—Dairymaids who have won a prize at any agricultural or dairy show. (2) *Wednesday, June 25.*—Dairymaids who have not won a prize at any agricultural or dairy show.

21. Another interesting feature of the Plymouth Meeting will be a competition of Shoeing Smiths practising in the counties comprised in the district of the Show. The competition will be in two classes—Hunters and Agricultural Horses—and five Prizes will be offered in each class. The Worshipful Company of Farriers have generously offered to provide a First Prize of 10*l.* in each of these two classes, and to bestow the freedom of their Guild upon the two First-Prize winners. This public-spirited proposal has been cordially accepted by the Council, who have expressed to the Company their willingness to co-operate with it in its efforts to promote skilled farriery and the registration of duly-qualified Farriers.

22. Prizes amounting to 300*l.* have been offered in three classes by the Plymouth Local Committee for the best-managed Farms in the counties of Devon and Cornwall. The number of farms entered for competition is seventeen, and the Judges will start on their first tour of inspection shortly after Christmas.

23. The Council have agreed to continue for another year the grant of three Premiums and Gold Medals for thoroughbred Stallions serving Mares in District D, which comprises Berkshire, Cornwall, Devonshire, Dorsetshire, Hampshire, Kent, Somerset, Surrey, Sussex, and Wiltshire. These Premiums will be competed for at the same time, and generally under the same conditions, as the twenty-two Queen's Premiums offered by the Royal Commission on Horse-breeding. Arrangements have again been made, in conjunction with the Hackney Horse Society and Hunters' Improvement Society, for holding a Joint Show at the Royal Agricultural Hall, London, on March 4, 5, 6, and 7, 1890. Members of the Society will be entitled to free admission to this Show on making previous application for tickets to the Secretary.

24. The Council have received an invitation from the Town Council of Leeds to hold the Society's Country Meeting of 1891 in that town. The customary Committee of Inspection has been appointed to report on the site and other accommodation offered, and

a final decision as to the place of meeting in 1891 will be made by the Council in February next.

25. The Council refer with satisfaction to the recent establishment, under an Act of last Session, of a Board of Agriculture, with their colleague, Mr. Chaplin, at its head, and they trust that the interests of the agricultural community will now receive adequate consideration at the hands of Her Majesty's Government. They are especially of opinion that, in view of the continued prevalence of pleuro-pneumonia, the Government should undertake, without further delay, the stamping out of that disease from the country, since the result of the working of the Pleuro-Pneumonia Slaughter Order of 1888 during the past six months has been very disappointing and unsatisfactory. The number of fresh outbreaks has increased, as compared with the returns of the preceding half-year; and though it is true there has been a slight decrease in England, which may possibly be due to accidental causes, in Scotland the outbreaks have increased over 90 per cent. One reason why the Order has not proved to be more successful, appears to be the want of uniformity of action on the part of Local Authorities. In some districts, where the requirements of the Order have been promptly carried out, the disease has been for a time eradicated, only to be re-introduced from others where the provisions of the Order have been less rigidly enforced. It is evident, from the number of fresh outbreaks which have during the past few months occurred among cattle soon after purchase, that infected animals still find their way into markets and sale-yards, and afterwards prove the means of establishing fresh centres of the disease. If all cattle exposed to infection were slaughtered within ten days, as required by the Order, no infected animals could be thus moved, and publicly exposed for sale. With the present regulations in force, infected cattle, which spread pleuro-pneumonia from markets, sale-yards, and dealers' premises, must have come originally out of some place where the disease had existed and been concealed, or, if reported, the Local Authority had failed to slaughter all the animals exposed to infection. As at present administered, the Slaughter Order has up to the present time failed to make any satisfactory progress towards the eradication of the disease.

26. In view of these circumstances, the Council, at their meeting on November 6, adopted the following resolution, which has been forwarded to the Board of Agriculture :—

That the Government should take action in regard to pleuro-pneumonia, and that they should apply the necessary measures for stamping out the disease by slaughter, under Imperial control, and at the cost of the Imperial exchequer.

The Council have also called the attention of the Board of Agriculture to the continued spreading of swine-fever, and to the want of uniformity in the regulations which are issued by the various Local Authorities for the purpose of checking the disease.

27. The Council have appointed as Provincial Veterinary Surgeons of the Society, Mr. J. Dawson Roberts, of Aberystwith, for the County of Cardigan ; and Mr. F. Booth, of Abergele, for the counties of Denbigh and Carnarvon.

28. Investigations have been carried on by the Society during the past year into the lung-worm disease of young cattle and sheep, and some important facts in the life-history of the parasite have been ascertained. It seems now to be placed beyond doubt that the embryos of the lung-worm find a temporary resting-place in the common earthworm ; in the digestive system of sheep they undergo developmental changes which fit them for residence in the warm-blooded animal. Inquiries have also been conducted with the view to ascertain which of the many micro-organisms found in the diseased organs of swine dead of swine-fever is capable of inducing the disease. Up to the present, more than a dozen different microbes have been tested, but none of them caused any kind of illness when introduced into the digestive system of healthy pigs.

29. Investigations have been made, at the request of Members of the Society, into outbreaks of disease in various parts of the country. The diseases which have been met with are :—Abortion in cows, tapeworms and hydatids in sheep, actinomycosis in cattle, contagious skin disease of sheep, tuberculosis in cattle, sheep, swine, and poultry ; a fatal form of blood disease in poultry, somewhat resembling chicken cholera ; a malignant form of mouth disease in calves ; and a fatal disease, the true character of which has not yet been determined, in herds of deer in parts of the country widely separated from each other. All these investigations (the expenses attending which have been defrayed out of grants of money made by the Society for the purpose) will be described at length in the Annual Report of the Royal Veterinary College for 1889, to appear in the Journal [see page 184].

30. The Council, conscious of the necessity of the work of scientific investigation into the diseases of animals being carried on continuously, have resolved, instead of giving their customary grant to the Royal Veterinary College for general purposes in connection with cattle pathology, to make an annual grant of 500*l.* for establishing a Chair of Comparative Pathology and Bacteriology at the Royal Veterinary College, subject to the College undertaking, as before, to investigate any outbreaks of disease amongst animals that may be reported by Members of the Society, and to defray the expenses of such investigations when considered necessary or advisable, and to the existing veterinary privileges of Members being continued as at present.

31. The Second Series of the Journal, commenced in 1865, having been completed by the volume just issued, the Council have given ~~serious~~ ^{serious} consideration to the subject of the lines to be laid down for the Third Series. It has been their endeavour to come to such a

decision with regard to the future publication of the Journal as shall maintain its high character, and increase, if possible, its influence upon English Agriculture. They have resolved that the Journal shall be published in future at quarterly intervals, and that the Third Series, to commence next year, shall contain as essential features, in addition to signed articles by experts, as heretofore, the reports of the Monthly Meetings of Council, notes on current agricultural facts, and notices of new agricultural works, British and foreign.

32. The Council regret to announce that Mr. William Anderson, who for many years has occupied, with great advantage to the Society, the position of Consulting Engineer, has been compelled to resign the office, in consequence of his appointment by the Secretary of State for War to the office of Director-General of Ordnance Factories. The Council, reverting to a practice previously adopted, have appointed the firm of Easton & Anderson, Limited, as Consulting Engineers to the Society, and have elected Mr. Anderson as one of the Honorary Members of the Society, in recognition of the valuable services which he has rendered to it.

33. The Secretary of State for India, on the recommendation of Sir James Caird, has selected Dr. Voelcker, the Society's Consulting Chemist, to proceed to India to confer with the Government, and, after personal examination and inquiry, to advise them as to the best course to be adopted for the improvement of Indian agriculture by scientific means. The Council, conscious of the honour reflected upon the Society by the selection of their officer for so important a mission, have readily granted leave of absence for one year to Dr. Voelcker to enable him to accept the appointment. They have at the same time been careful to make such arrangements for the conduct of the Society's Laboratory as shall effectually safeguard the interests of the Members during Dr. Voelcker's absence. Mr. E. W. Voelcker will act as the Society's Consulting Chemist during the year, and will make and sign analyses in that capacity.

34. The number of samples sent during the year to the Society's Chemical Laboratory has amounted to 1,435, showing some reduction on the high total obtained in 1888. In addition, however, to the samples sent by Members, upwards of 80 analyses of milk were made in connection with the awards in the Dairy Classes at the Windsor Show; whilst other investigations connected with the experiments at Woburn, and those of Local Agricultural Societies, add a further 123 to the number. The reports of the Chemical Committee have drawn special attention to the error of trusting to printed circulars regarding cakes and manures, instead of obtaining a guarantee for each particular delivery.

35. At the Society's experimental farm at Woburn, Mr. F. E. Fraser, who for the past five years has rendered very efficient service in the capacity of farm-manager, has been succeeded on his retirement by Mr. Arthur E. Elliott. The Woburn excursion was held

on July 4, and was very well attended. Experiments by Local Agricultural Societies have been continued on the part of the same three Societies as previously.

36. Four hundred applications have been made to the Consulting Botanist during the year, chiefly bearing on the quality of seeds, but also respecting the composition of pastures, the causes of injury to stock, the attacks of destructive parasites, and similar subjects. The grass-seeds show a complete absence of intentional adulterations: not a single instance of the mixture of rye-grass with the more expensive fescues, once so common, has been met with. Some samples of meadow foxtail germinated over 90 per cent., and of golden oat-grass, nearly 90 per cent. There has been a considerable amount of dodder in the clover-seed, not less than 24 per cent. of the samples of red clover, and 14 per cent. of alsike, containing seeds of dodder. The results of the inspection of the selected pastures throughout England will be published in the next number of the Journal [see page 95].

37. The work of the Consulting Entomologist continues to increase. In addition to advice to individual Members as to insect attacks upon their crops, Miss Ormerod has in her published reports given for general information much useful practical advice as to dealing with some especially injurious kinds of farm-insects. Amongst subjects which have received special attention, may be mentioned the prevention of warble attack, concerning which many inquiries have been received. The chief injury caused by insect attacks in the past season has been that of the orchard-pests. A few kinds of insect attacks injurious to fruit-trees or crops, which hitherto had not been recorded as present, have been observed in the past season, and have been duly reported by Miss Ormerod.

38. The Council have appointed the President, Mr. Frankish, and the Secretary, as delegates to represent the Society on the Committee of the Mansion House United Association on Railway Rates, and have voted the sum of 50*l.* as a contribution to the funds of the Association, with a view to assist in securing an adequate representation of the interests of agricultural objectors at the Board of Trade inquiry into the subject which is now proceeding.

39. The date of the next Senior Examination for the Society's Prizes and Certificates has been fixed for May 13 to 17, 1890. The Council have resolved to add Agricultural Entomology to this Examination as a voluntary subject, 100 marks being assigned to it.

40. The Annual Examination for the Society's ten Junior Scholarships of 20*l.* each took place on November 12 and 13, when thirty-seven candidates, from twelve schools, competed. Of these candidates, fifteen passed in all four subjects (Agriculture, Chemistry, ~~Mechanics~~, and Land-Surveying), and obtained the number of marks necessary to qualify them for the Society's Scholarships and Certifi-

cates in the event of their complying, during the forthcoming year, with the conditions of the Examination. Five other boys passed in each of the four subjects, but, not having obtained the minimum aggregate of marks, are ineligible for Certificates. Of the seventeen other unsuccessful candidates, six failed in one subject, five in two subjects, four in three subjects, and two in all four subjects. There were three failures in Agriculture, nine in Chemistry, fourteen in Mechanics, and ten in Land Surveying. Of the fifteen successful candidates, the first ten in the following list will receive Scholarships upon complying with the Society's regulations, and the remainder will receive Certificates :—

1. EDWIN COATES, Northampton Grammar School.
2. HERBERT FAULKNER LEE, Surrey County School.
3. HENRY HAMILTON CLEMENTS, Anahilt Endowed National School.
4. SAMUEL DAVID CROTHERS, Anahilt Endowed National School.
5. MONTAGU HOUNSELL COX, Surrey County School.
6. ARTHUR GEORGE HENRY VERRALL, Surrey County School.
7. WALTER ERNEST COATES WHITE, Aspatia Agricultural College.
8. ALFRED CALDECOTT, Queen's School, Basingstoke.
9. WILLIAM LONGMORE PARKIN, Northampton Grammar School.
10. PERCY SHELLEY, Surrey County School.
11. FRANCIS BEDFORD GLASIER, Norfolk County School.
12. } *eq.* { JOSEPH LISTER, Aspatia Agricultural College.
13. } { MARTIN HAMMOND WARD, Aspatia Agricultural College.
14. EDWARD HOWARD SMART, Portsmouth Grammar School.
15. TRACY FRENCH GAVIN JONES, Tamworth Agricultural College.

By Order of the Council,

(Signed) ERNEST CLARKE,

Secretary.

ANNUAL REPORT FOR 1889 OF THE CONSULTING BOTANIST.

DURING the year over four hundred applications have been made to me by members of the Society. The greater number have related to grass seeds, and the result of the year's work in this Department is that deliberate adulteration with cheaper and worthless seeds has practically ceased. This, of course, refers only to seeds that have been examined by me, as compared with similar seeds submitted to me only a few years ago. This improvement, as my Annual Reports show, has been gradual, but always advancing. No longer do I find meadow fescue and tall fescue largely composed of rye-grass, nor sweet vernal more or less completely replaced by the almost worthless annual vernal grass of the Continent; nor are the *two qualities* (!) of golden oat-grass brought under my notice, the cheaper, which was sold wholesale at one-third of the price of the other, having been

entirely *Aira flexuosa*, a grass no one would wish to see in a pasture.

The low germinating power of certain samples appears to me to show that some merchants carry over their surplus stock from year to year; under these circumstances the poas and some other small and delicate seeds get completely desiccated, and are unable to grow.

The two large fescues were quite free from rye-grass—a single sample of meadow fescue with 1 per cent. being scarcely an exception, for so small a quantity obviously got in without intention. The germination has also been satisfactory; the average of the meadow fescue was 96 per cent., in some cases reaching 100 per cent.; while in tall fescue the average germination was 87 per cent., and in hard fescue 84 per cent. A quarter of the samples of cocksfoot contained seeds of Yorkshire fog, and though the quantity was small—from 1 per cent. to 3 per cent.—it seems to me that the smallest quantity of this grass is undesirable in a pasture, and its presence is the more objectionable because it can easily be cleaned out. The germination of the cocksfoot averaged 93 per cent.

The samples of timothy were very clean, and the germination averaged 97 per cent.

The poas examined were free from foreign seed, and true to their kinds. The germination of the more valuable rough-stalked meadow grass averaged 77 per cent., while the wood meadow grass fell to 61 per cent.; and the smooth-stalked meadow grass reached an average of only 42 per cent.; and this figure was reached only because some good samples raised the average of the poorer qualities. As I have suggested, this is probably due to stocks of this seed being carried over from season to season.

The attention that has been year after year drawn to meadow foxtail has led to a great improvement in the quality of its seed. Some samples reached a germination of 90 per cent.; the average was, however, brought down to 62 per cent. by some very poor samples.

Crested dogtail was pure and clean, and had an average germination of 90 per cent.; tall oat-grass germinated 92 per cent.; golden oat-grass, 73 per cent.; and sweet-scented vernal grass, 72 per cent.

The rye-grasses are more impure than any other seeds that I have examined. Forty per cent. of the samples of both perennial and Italian rye-grass had the seeds of weeds or other injurious impurities, sometimes amounting to as much as 10 per cent. The objectionable grasses that in this way got into fields were Yorkshire fog and soft brome grass.

The leguminous seeds were all of a superior quality, with the exception of the presence of dodder seeds in the red clovers to the extent of 14 per cent. of the samples, and in alsike, to the extent of 4 per cent. of the samples. This is so destructive a weed to the crop that no seed which contains any of it should be used. White clover is the most impure of all the clovers; a sample is very seldom met with that does not contain some seeds of sorrel. The average

germination of white clover was 90 per cent., red clover 92 per cent., and alsike 94 per cent. Trefoil is, as a rule, singularly free from impurities; the average germination was 93 per cent. Sainfoin reached only 69 per cent., and lucerne averaged 94 per cent.

I would like to call attention to a practice far from uncommon in different parts of the country. It is thought that the grasses most suitable for the soil of a district are those that grow freely in the neighbourhood; and that, consequently, the seeds from any neighbouring field of meadow hay must give the very plants that are to be desired in a new pasture. I have had several cases of this kind brought under my notice during the season, and in each case have been compelled to utterly condemn the mixture thus obtained. I will give the analyses of two samples from the same locality which were thus obtained. The first sample of home-grown hay-seed consisted of—

	Per cent.		Per cent.
Yorkshire fog	57	Hard fescue	4
Perennial rye-grass	19	Poa	2
Crested dogtail	11	Meadow fescue	1
Italian rye-grass	4	Cocksfoot	1

The second sample of screened home-grown hay-seed consisted of—

	Per cent.		Per cent.
Perennial rye-grass	60	Sterile brome grass	3
Ribgrass or plantain	8	Yellow rattle	2
Yorkshire fog	7	Italian rye-grass	2
Soft brome grass	7	Meadow fescue	1
Crested dogtail	5	Other grasses	2
Buttercup	3		

During the month of July I visited the thirteen selected pastures scattered over the South and West of England. I compared the enclosed pieces with the general pasture of the field in which they were situated, and afterwards, with the help of my son, analysed the herbage of the enclosed portions, which was carefully cut, and forwarded to my laboratory at Norwood. The report of the results appears in another part of the present number of the Journal.

The comparatively small increase in the applications during the past year appears to me to show that the members do not know the small fee for which the purity and germinating power of their seeds can be ascertained.

WM. CARRUTHERS.

ANNUAL REPORT FOR 1889 OF THE CONSULTING ENTOMOLOGIST.¹

(WITH ADDITIONS FROM REPORT OF MARCH 5, 1890.)

THE following annual report gives an abstract of the main points of the entomological work of the twelve months from December 1888 to December 1889, to which is appended more full detail regarding some kinds of injurious insect attacks not previously recorded as being present in this country, and some other points of practical interest regarding effects of, or remedies for, insect infestation.

During the past season the amount of inquiry and business coming to my hands has continued to increase. The home correspondence regarding identification and means of prevention of farm crop and orchard insect pests continues now throughout the year, and also frequent inquiry as to means of giving or procuring information in agricultural entomology, and other subjects connected with the work.

There has also been much correspondence, colonial and foreign, especially with the United States, partly regarding special insect attacks, and frequently consisting of consultation letters with leading official entomologists, by which I am greatly assisted.

The number of letters I have written on the above subjects during the past official year (from December to December) is approximately upwards of 1,257. I do not include in these short notes written by my assistants to accompany pamphlets asked for, or the like.

Inquiries have as usual been sent in regarding almost all the regularly known crop and orchard insect pests, which it is unnecessary to enumerate here, but, excepting with regard to orchard insects, I am not aware of widespread attacks of any special kind of insect having occurred over large districts during the past season, and amongst some of the kinds quite exceptionally observed as present in 1888, the beet carrion beetle has not been reported at all, and frit fly in oats at only two or three places.

Some few kinds, scarcely or not at all noticed here before as injurious, were observed in the past season; namely, the attack of a small beetle to turnips at a locality in Aberdeenshire, and a red maggot on barley at one place in Lincolnshire; a large white woolly scale most extraordinarily prevalent on various kinds of currants, where it established itself at all, and a small boring beetle, of which the attack is very rapidly fatal to young plum trees.

¹ In figs. 4 and 5 in this paper, those of the winged moths and of the wingless moths to right-hand side are from *British Moths* by Edw. Newman; the wingless moth and looper caterpillar to left in above figures respectively are from *Die praktische Insektenkunde* of Dr. E. L. Taschenberg. The other illustrations, namely, figs. 1, 2, 3, 6, and 7, are figured from original specimens for my own publications, and are lent for this paper.—E. A. O.

These I duly reported on successively, but it seems worth observation that, as in the case of the Hessian fly, these newly or lately recorded arrivals were, with the exception of the plum borer, for the most part on, or near, the east coast of the island.

Some very good information has been brought forward as to various proved and serviceable methods of prevention, notably with regard to checking clover-stem sickness as soon as the plants have power of spring growth in them; also with regard to the attack (which is sometimes excessively destructive) of turnip diamond-back moth.

The subject of warble prevention has also very much advanced. With each succeeding year this has been more and more taken up by cattle owners and farmers, and now, in addition to the help given by many influential hide firms, much is being also given by leading men in various Butchers' Associations drawing attention widely through England, Scotland, and Ireland, to the loss from this cause on meat, the importance of the subject, and the proved and easy remedies. I am in constant communication on the subject. Steady distribution of the leaflets still continues, and I shall be happy to continue to forward them to all applicants interested in warble prevention who may apply to me.

The work has now increased to such an extent that by devoting my whole time to it, and with the help of amanuenses at home, and (by correspondence) the skilled and well-known aid of Mr. Oliver E. Janson, F.E.S., in identification of "extra British," or preigiously undescribed specimens, I have (I believe) been able fully to attend to inquiry and consultation business, and most scrupulously to that belonging to my work as Entomologist to the Society.

But there is a great deal of good work in the way of insect prevention experiments offered from time to time which I have not been able to take up, because the requisite co-operation in correspondence was more than I could possibly manage, and if any arrangement could be made by which I could give attention to these, it would be of very great agricultural service.

With regard to further details, taking Hessian fly presence first:—

During the past season, judging from reports sent to myself, Hessian fly attack appears to have done very little serious damage. One report was sent in of an attack on fifty-nine acres of barley, in which it was estimated that every fifth straw was broken down; otherwise, although it appeared in some districts not previously reported as infested, and where it was noticed as very prevalent, yet damage was either usually not mentioned, or mentioned as not considerable.

At the Royal Agricultural College, Cirencester, where it was exceedingly prevalent on wheat and barley, in the College grounds and neighbourhood, the loss was estimated not to exceed 4 per cent. in any case. At Revell's Hall, near Hertford (where the attack was first observed in England), although at threshing time infestation was found to have been present, from the large number of "flax-seeds"

found in the screenings, little of it had been observed on the corn before harvest, and little harm had apparently been caused to the crops. At Daleally, near Errol (where the attack was first observed in Scotland), I am informed, on special inquiry, that it was not found at all.

The reports of this, as well as of last year, give good hope that our wheats will not suffer to a serious extent; but for the sake of barley (which is much more liable to injury), it is very important that the plain common-sense measures of prevention previously mentioned should be carried out.

SADDLE FLY, *Cecidomyia* (? *Diplosis*) *equestris*, Wagner.

Another form of cecidomyioid attack (that is, attack of red maggots very much resembling in shape and colour those of a common wheat midge), but which, I believe, has not hitherto been recorded in Britain, has occurred to a slight extent on barley straw near Alford, in Lincolnshire. At present I have not been able to secure the fly, but as far as I can make out the insect will turn out to be the *Cecidomyia* (*Diplosis*) *equestris* of Wagner, commonly known as the saddle fly, from the saddle-like form of the injury which the maggots cause to the infested straw. In the specimens sent me, the little saddle-like spots, each formed of a slight hollow with a raised border of diseased growth around it, and set either singly or in a succession of four or five saddles along the straw, were very noticeable, and unlike any other attack which I have seen.

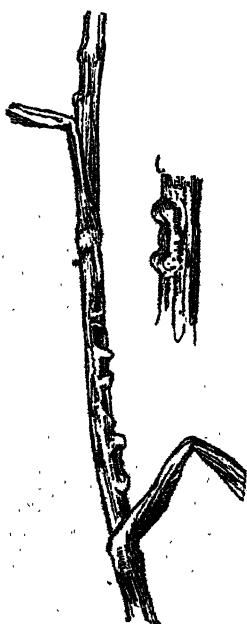


Fig. 1.—Barley stem attacked by saddle fly "red maggots."

This attack may very likely have come from a good deal of thin foreign barley, full of dirt, weed, seeds, and other rubbish, which was sold at Alford market; I will endeavour, if injury reappears, to get complete observations.

SHOT BORER BEETLE, *Xyleborus dispar*, Fab.

An attack of serious importance to fruit growers occurred in stems of young plum trees at Toddington. The cause of the mischief is a small blackish beetle, the *Xyleborus dispar*, Fab., so named from the disparity in size and shape between the male and the female. The female is somewhat cylindrical, with a little lump on the forepart of the body, and is little more than a line long; but the male is only about two-thirds of that length, and rounded in outline.

(See Fig. 2.)

The beetles bore into the hard wood of the stems of young

trees, and kill the part above with great rapidity. On examination, I found that one beetle tunnel was bored horizontally about two-thirds round the stem, and from this three or more tunnels went directly upwards and downwards, one of these clearing out an inch or two of the central pith.

Thus, in consequence of the stem being partially ringed, and the loss of sap also, the attack very rapidly proves fatal. The beetle lives in all its stages in borings in the wood. Those stems that I opened were about three-quarters of an inch in diameter, and the group of short galleries were then (about the middle of September) absolutely crammed full and crowded with the beetles, which habit

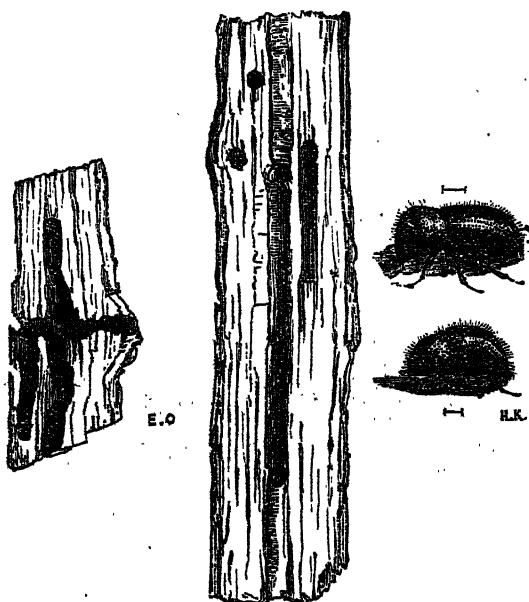


Fig. 2.—*Xyleborus dispar*, male and female, mag. Lines showing nat. length, and plum stems tunnelled by "shot borer" attack.

appears to be one of the peculiarities of this insect. It attacks apple and plum trees, as well as many kinds of forest trees, but hitherto has been extremely rare in England.

As this newly-observed infestation is a very serious matter to fruit growers, I put myself into communication both with America and the Continent, as to what measures could be taken to stop it. I find from the observations of Herr W. Eichhoff, Imperial Ranger of the Forests of Alsace, that this infestation can be very much kept in bounds by precisely the same kind of precautions which have long been used here to check increase of pine plantation beetles.

The "Shot-borers" have been found (where they have the

choice) to select by preference, for tunnelling and breeding purposes, the stems of lately felled or fallen trees, or stumps remaining in the ground, or pieces of fallen branches, rather than the growing trees. Therefore, for purposes of checking the infestation, besides removing the young trees which are rapidly killed by the attack and burning them (with the contained pests), the removal also of all such nurseries of infestation as the above clears away much coming mischief.

The female beetles have powerful wings, but before they take flight may be found by tens, or scores, in their tunnels, and, therefore, besides destroying these in swarms as noted above, it answers well to set traps by placing pieces of newly-felled branches or poles amongst the trees to be protected.

This can be done with little trouble, beginning about March, and the branches (or "trap-wood") should be examined about every three or four weeks, and if at all bored into carried off and burnt, and other pieces set up about the orchard.

It will also very likely be found that, as these beetles (like several of our most destructive kinds) attack by preference stems in which the sap is *not* in full flow, it will be the young recently removed trees which require chiefly to be guarded against their attacks. This appears to be best done as advised in Canada, by coating the bark of neighbouring trees with whitewash or soft soap, with a little Paris green or a little carbolic acid added, in quantities that will be certain not to hurt the bark, but of which the smell will deter the beetles from boring into it in the spring. It is really of great importance to fruit growers not to allow this new infestation to take hold, as, where once established, it causes what is not inaptly described by one sufferer as fairly a "slaughter" of the trees.

WHITE WOOLLY CURRANT SCALE, *Pulvinaria Ribesiae*, Signoret.

On July 30 I first reported notice of a large white woolly scale insect, which has only recently been observed in this country, and which requires attention. Its spread would be very injurious to fruit farmers, as it infests the black and also the red and white currants in profusion; it also is found on the flowering currant: and as I have two notices of it (or a scale insect indistinguishable from it) being found on the mountain ash (*Pyrus aucuparia*), attention is very desirable to see that it does not infest other kinds of *Pyrus*, namely, apple and pear trees.

The scale insect has been identified by Mr. J. W. Douglas, one of our chief British authorities on this family of insects, as the *Pulvinaria ribesiae* of Signoret, a species known in France and Germany, but which he had not previously been aware of the presence of in England, and it was also quite new to myself.

It may be perfectly easily distinguished in summer by the white, woolly egg-bags, about a quarter of an inch long, and rather flattened, looking in the distance like little lumps of whitewash, and clustered so thickly over the infested boughs that I have

counted sixty or more on a slightly-forked branch of currant only about a foot long.

On the top of these egg-bags, at one end, is the brown, dead coat of the mother scale, and within a great number of eggs. From these hatch such multitudes of young scale insects that as they crawl in all directions they give the white wool the appearance of having been dusted with cayenne pepper, and might claim the name given to one American kind—the *Pulvinaria innumerabilis*. These scale insects disperse themselves very rapidly in their early stages, and do mischief by drawing away the juices of the plants with their suckers.

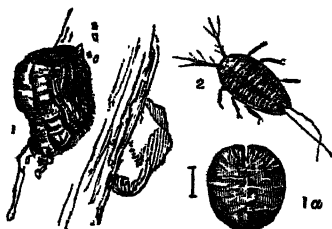


Fig. 3.—*Pulvinaria Ribesiae*. 1 and 1a, Female scale with woolly egg-sac and scale removed, mag. Line giving nat. length of scale. 2, Larva magnified.

The attack has been reported (in almost every case with specimens accompanying) from Wakefield and Huddersfield, and also from various localities in Scotland, chiefly near the sea-coast, from Macduff in Bantffshire to near Berwick-on-Tweed. In two of these localities it had been noticed a few years ago, otherwise it does not seem to have been observed until this summer, or possibly last year.

As it was very desirable to check its increase at once, I recommended, by the help of the newspapers, as well as by letter, that infested bushes should be burnt on the spot where they had grown. Thus the great risk of dropping young scales about amongst the bushes is avoided, and such as may have fallen beneath the bushes will also be destroyed. I am favoured by information from Mr. W. McKenzie, gardener at Glen Muick, Aberdeenshire, that, when other means to get the pest under failed, he found the application of limewash during autumn, in proportion of one gallon of water to two pounds of hot lime, applied by means of a brush to the infested branches in the autumn, to be an effectual cure.

With a little timely attention this scale attack can be kept well in check, but if neglected it is likely to prove a serious inconvenience.

LOOPER caterpillars of WINTER MOTH, *Chimatobia brumata*, L., and MOTTLED UMBER MOTH, *Hybernica defoliaria*, L.

With regard to the great injury caused by insect orchard pests, and especially by the looper caterpillars of the winter moth, communication has been frequent throughout much of the year, but space¹ here only allows mention of a little as to the time and best method of banding the trees as a preventive of attack.

¹ In my own Annual Report for 1889 (13th Report) I have given in detail such information as I have been able to procure regarding different kinds of grease, and methods of application, and also regarding subsequent measures to destroy eggs and caterpillars.—E. A. O.

By November 6 I had been for some weeks receiving information of appearance of the winter moths, and also specimens; and I advised that where measures had not yet been taken to prevent the wingless females creeping up the trees to deposit their eggs,



Fig. 4.—*Winter moths. Male and wingless females.*

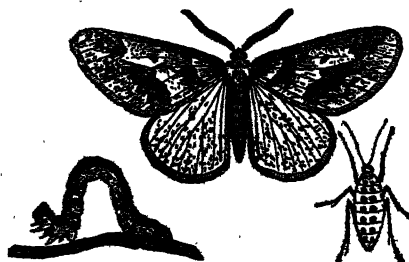


Fig. 5.—*Mottled umber moth. Male, wingless female, and caterpillar.*

these should be attended to as promptly as possible. From the first observation, on or about October 11, until the middle of December, notes of presence of the wingless moths continued to be sent, showing the necessity of *beginning to band early*, repeating the application. Banding the trees with cart-grease appears to be the most practicable of the measures recommended, but care should be taken (as the mixtures sold under this name vary in composition) to ascertain that whatever is chosen should not be mixed with tar or petroleum, or any other material liable to be injurious to bark, in sufficient quantity to make the application dangerous to the bark or tender outside wood of the tree. On old apple trees, where the bark is dead outside and too thick to be easily permeated, there is not much danger, but on young trees, where the bark is still very thin, great care should be exercised. The plan followed at the Toddington fruit grounds (where from eighty to a hundred and twenty thousand trees are being protected this season) is to wrap a band of the common thin grease-proof paper, such as is used by grocers, round the tree, to paste the overlapping edges together, and lay the grease on the paper. In this manner the risk of the grease melting into the tree is avoided.

Where measures of this kind cannot be carried out, care should be taken not to "grease-band" in the same part of the tree where it was applied last year. Various points are now under consideration from results of experiments of last season, which it is hoped may be of practical service when caterpillar time comes round again.

FURTHER REPORT ON ORCHARD CATERPILLARS.¹

In consequence of the great losses which have now occurred for several successive years, from attack of moth caterpillars, to the

¹ From report submitted on March 5, 1890.

orchard trees in most of our chief fruit-growing counties, some of the chief orchard growers in Worcestershire and Gloucestershire held at the end of February 1890 a special conference at Evesham to consider what concerted preventive measures could be taken.

At their desire I am in communication and co-operation with them, and am placing in their hands the best information attainable, both as to the nature and habits of the most injurious kinds of caterpillars and the methods of preventive treatment which have been found to answer best.

But in this country little advance has as yet been made beyond "grease-banding," which certainly does prevent much of the infestation so far as it is caused by looper caterpillars of the wingless moths; but it is a tedious process, requiring to be yearly repeated, and is injurious to the trees unless much care is taken to protect the bark. Also, whilst it is not wholly efficacious, even in preventing attack of loopers (that is, of the caterpillars of the winter moth and its allies), it is *wholly useless* in preventing attack of the many kinds of moths which come on the wing to lay eggs on the trees.

It is a perfect impossibility that all the attacks caused by these different kinds of moths can be prevented by destroying them in chrysalis state, as this would require a search literally everywhere—on the surface of the ground and just below it—on the bark of the trees, on hedges, walls, palings, in sheds, &c., and this at different seasons of the year.

Insectivorous birds would help, but, as many are mixed feeders, if these are (as is often suggested) greatly increased in numbers they will be very apt to do more harm than good by supplying deficiencies of diet from the tree buds.

What we want, therefore, I believe, are measures (such as have been used successfully now for years in the United States and Canada) which can be brought to bear at once on the trees when the caterpillar pests of all the different kinds are ravaging together, and which will sweep them off at very moderate expense without damaging the leafage.

During the winter I have been consulting on this subject with Mr. Fletcher, the Dominion Entomologist of Canada, who is perfectly well versed, both scientifically and practically, in management of these attacks, and two valuable letters have been sent by him to Captain Corbett, the Superintendent of the Toddington Fruit Grounds. Also, I have sent to Evesham notes with regard to measures for so dressing the trunks of trees as to prevent the ascent of caterpillars which might cross dry grease-bands or hatch from eggs thereon, and information as to applications serviceably used in America for "washing" off the caterpillars, with requisite details and cautions.

Also it has been now arranged by the Evesham Conference to form a committee of experiment, so that effects of treatment may be carefully tried on a sound basis, both as to the applications, and the apparatus by which they are thrown, and results reported, and this, I hope, will do much good. I am myself co-operating to the best of my power.

CLOVER "STEM-SICKNESS,"

caused by *Tylenchus devastatrix*, Kuhn (a species of very minute white eelworm), within the plant.

During the latter part of the winter of 1888, and up to May in 1889, I received many communications regarding serious failure of clover crops, with specimens of various kinds of insects, worms, or other supposed causes of the injury, sent accompanying. In all cases, however, in which sufficient material was sent to me for complete investigation (that is to say, where plenty of specimens of the whole plants were forwarded), I have no hesitation in saying that the disease was due to the presence of the *Tylenchus devastatrix*, Kuhn, the same kind of minute nematode, or eelworm, which causes the disease known as "tulip-root" in oat plants, and which attacks many other grasses and wild plants, and some other regular crops. This attack may be known by the presence of the minute eelworms, often in great numbers, together with their eggs, in the infested buds and stems, and also (and more conveniently for general purposes) by the infested shoots having usually a more or less deformed growth.

In some cases the buds were inflated, and the branches shorter and thicker than in the regular clover growth, and also, especially from one locality, the abnormal buds, or shoots, checked by the eelworm presence, though now decayed, showed a kind of bulb shape, like a knot of large leaf-scales; and one most especially injured shoot had about six of these shortened shoots placed almost close together on the central stem.

By these growths the attack may be distinguished, when it is severe, as easily as the bulb-like *Tylenchus* attack to oat plants known as "tulip-root" may be distinguished by the somewhat tulip-bulb-formed swelling of the base of the stem, with the fringe of thin, pale, doubled-up shoots growing around. Both attacks are caused by presence of the *Tylenchus devastatrix*, or "stem-eelworm," as has been proved by infesting one kind of plant from the other.

The "stem-eelworms" may be found in all stages, and male and female as well as young and eggs, in the infested buds and stems.

As it was eminently desirable that we should know the species beyond possibility of mistake, I submitted specimens from both Woburn and Rothamsted for technical examination by Dr. J. Ritzema Bos, Professor at the State Agricultural College, Wageningen, Netherlands, as being one of the highest authorities on the subject, and these plants he found to be diseased in the same manner—that is, to have the same deformed growth as clover infested by *T. devastatrix*, which he had studied in the field in the Netherlands, and in the swollen buds and in the shoots he found this *Tylenchus* in large numbers, and he also found the eggs.

In the dying parts of the plant other nematodes were present in small numbers of different kinds, as *Cephalobus*, *Ehabotus*, and *Diplogaster*, but these are immaterial to the present inquiry.

As these clover attacks precisely agree with those which have been carefully and repeatedly studied by Mr. Whitehead and myself, with frequent reference of our observations for verification to Dr. Ritzema Bos and Dr. J. G. de Man, of Middleburg, and the microscopic measurements have been checked by reference to those of Dr. Kuhn, Director of the Agricultural Institute, Halle, Germany (another leading authority on the subject), I do not think that there is the least ground for doubt that the attacks of clover sickness now specially under consideration are caused by the "stem eelworm," the *Tylenchus devastatrix*, Kuhn; and I mention this so particularly because the form of attack being now before the managers of two such important agricultural stations as Woburn and Rothamsted, they will be able to point out widely the connection of the outward signs of deformed growth with internal presence of the "stem eelworms" which cause this "sickness," and (where microscopic appliances and figures of *Nematodes* are at hand for reference) the *Tylenchi* may be identified.¹

As, however, these little white wormlets are very small—only about the twenty-fourth part of an inch long when full-grown—for general purposes with this clover "stem sickness," as with the "Tulip-root" disease of oats, it is on the external appearance of the diseased crop that we must mainly rest for identification.

I would venture to suggest that, as clover suffers under several attacks, and much uncertainty arises from the term of "sickness" being applied to them all, it would be a convenient and correct distinction to adopt the Continental term of 'stem-sickness' where it is wished to particularise the attack of the *Tylenchus devastatrix*, which is more especially known as "L'anguillule de la tige," or "stem-eelworm."

The best applications which have been reported to me for preventing or checking eelworm attack have been sulphate of potash, sulphate of ammonia, and phosphates, the first two in largest proportion; or sulphate of potash alone, which has had excellent effect in checking eelworm attack when beginning to show itself.

In the experiments on stem-sick clover at Rothamsted of which I was permitted to have notes, forwarded to me by Mr. John Willis, it was found that a mixture of sulphate of potash, 3 cwt., and sulphate of ammonia, 1 cwt., per acre, acted well; as did also sulphate of iron applied on another plot at the rate of 2 cwt. the acre. These applications were given on April 3, and on examination on May 14 it was found that the disease had entirely ceased, and the clover was growing most vigorously.

The above manurial applications extended their beneficial effects to the second crop. On July 26 the vigour of plant was reported as very marked on the plot which received the potash and ammonia mixture; the growth was not so luxuriant on the plot treated with

¹ For full description of *T. devastatrix*, with life-history, and method of injury to various crops, together with full illustration in all stages, see *L'anguillule de la Tige et les maladies des plantes dues à ce Nématode*. Par Dr. J. Ritzema Bos.

the 2 cwt. of sulphate of iron, but in each of the above cases the ravages of the *Tylenchus* had quite ceased.

The attack is excessively liable to be carried in infested earth, or in manure of stock fed on infested fodder (as these nematodes are not killed by passing through the animals in process of digestion). They also infest many kinds of grasses, and crop weeds, and some other ordinary field and garden crops.

Also it should be borne in mind that, as the wormlets lie much on the surface of the earth in infested fields, common digging (which is sometimes resorted to as a remedy) is by no means sure to be successful. Trenching, or deep ploughing with a skim coulter, is useful treatment, for thus the wormlets are turned down to a depth at which they will perish.

FLOUR MOTH.¹

I much regret to have to mention that the very seriously injurious wheat flour mill (and flour and meal store) pest, the *Ephestia Kuhnella*, called specially "the flour moth," is quietly and steadily establishing a footing in this country.

The harm caused by this infestation, where it gains entrance into rolling mills in which wheat only is ground, can hardly be over-estimated. The caterpillars spread themselves everywhere, get into the spouts and machinery, and do unbounded mischief, especially by injury to the silks, and stopping the flow of flour in the spouts, by spinning webs and hanging on them.

It is most difficult to deal with this attack thoroughly, for, as it would temporarily ruin the business of the mills for them to be known to be centres of infestation, all the applications to myself are made in business confidence.

Where various kinds of corn could be ground, there would be no difficulty at all in clearing out this pest by substituting a kind on which the caterpillars did not feed for a few weeks; but, where wheat only is ground, the sole method which has been found really to answer in clearing the attack out tolerably, is to stop the working of the mill for a short time, and, by means of pipes or hose from the engine, to drive hot steam into every accessible part.

This, of course, rusts the shafting, but that is a lesser evil. After the steaming, a thorough whitewashing of walls and all that can be lime-washed, cleansing the floors with hot lime and with paraffin oil, and afterwards fumigating from time to time with sulphur, have been found to keep the attack in check; but still this does not stamp it out, so as to prevent risks of the pests being distributed to set up infestation in all places connected with transmission of wheat flour, or exchange of sacks.

On the first breaking out of the attack in Canada I forwarded, by desire of the Department of Agriculture of Ontario, information as to what was being done under my own suggestion here, and they improved on the plan by having a steam-proof chamber built in

¹ From Report presented March 5, 1890.

which the portions of the machinery which could be subjected to the treatment were exposed to the action of superheated steam.

I drew attention to the attack last year, but from its continuance and spread, and also from the fact that, for obvious reasons, no miller or storeholder will warn his neighbours of their risk, it appears very desirable to suggest to all concerned that they should be on the watch, lest it should be brought into their premises; and one most desirable precaution is scrupulous care as to the condition of returned sacks. The moths very especially lay their eggs on sacks, and brushing and baking would be most desirable precautionary measures.

One characteristic of the attack is the manner in which the caterpillars web up the infested flour or meal into felt-like masses. When full grown, these grubs are rather over half an inch in length, and of various shades, from white to pale flesh colour, with brown heads and some other small brown markings, and the little moths are grey, with paler and somewhat yellower and half-transparent hinder wings.

In one of the first appearances of this infestation in one of the large London stores, the attack took hold so fast that one whole warehouse was rapidly filled (smothered, as it was expressed) by the grubs, and several hundreds of pounds' worth of damage was done. In the Canadian outbreak, where I have knowledge of cost of operations, damage from loss and preventive necessities was estimated at 1,000*l.*, and I have myself also knowledge of the heavy loss and excessive inconvenience caused in this country.

After much investigation, it appears to be considered that the chief centres from which this pest has been distributed are the South European Mediterranean ports. Any details which may be desired, I would of course furnish on application.

WARBLE FLY, *Hypoderma bovis*, De Geer.

Warble attack receives constantly increasing attention. On March 5, 1889, I submitted the following abstract of information, with which I had been favoured in replies to my many inquiries regarding amount of money loss on hides from warble injury (during one year, or during the warble season) from several of the chief hide market companies or inspection societies—namely, from Aberdeen, Bristol, Glasgow, Leeds, Liverpool, Newcastle-on-Tyne, Nottingham, Sheffield, &c.

Quoting generally from these—as I cannot give full details in the space now allowable—the number of hides passing through these markets respectively are from about 30,000 and upwards to three or four times that number in the year; in some instances the numbers exceed 100,000 in the year, and in two instances amounted respectively to about 130,000 per year, and to nearly 150,000.

At one market where 30,000 were sold in one year, one-third of these—that is 10,000—hides were warbled; the reduction in value (estimated at an average of 3*s.* per hide) giving a total loss of

1,500%.—this estimate being given as under rather than over the mark.

The estimates of loss per hide at the markets vary from about 2s. 6d. to 5s. or sometimes over that sum per warbled hide, and the average weight of hide from which the calculations or estimates are made is (where mentioned) about 65lb.

The exact proportion of warbled hides is difficult to ascertain, excepting at markets where hides so injured are classed by themselves; but these are given in some cases, and by calculation or estimate the loss at various of the above markets on warbled hides runs in the year reported (or during the four or five months specially known as the warble months) to sums of respectively 1,400% ; 1,500% to 2,000% ; 1,800% ; 2,800% ; and at one of the chief hide centres, where there is careful attention paid to inspection, the loss

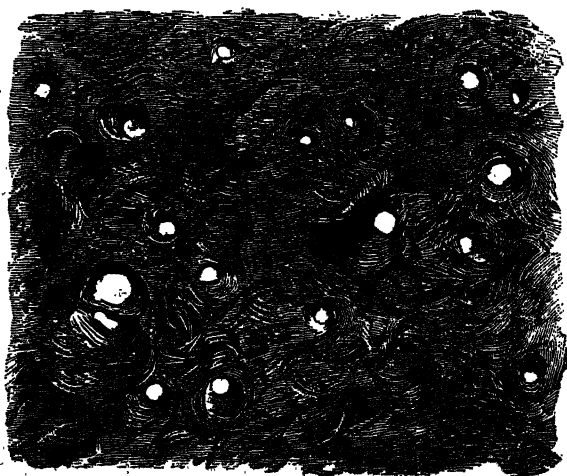


Fig. 6.—*Portion of inside of tanned warbled hide.*

in the year reported was 15,000%. In the return from one town where the amount of cattle slaughtered per week is 700, the proportion of warbled hides during summer and autumn is fully one-third, and the average loss on these is calculated at not less than 5s. per hide.

It should be observed, however (as pointed out by two of the firms), that this original depreciation in value by no means represents the whole loss, because, after outlay of tanning, many hides are then found to be useless for the purpose for which they were intended, and this in some places is considered to enormously increase the loss, even up to twice the original amount.

Neither does the above statement include hides taken direct by tanners and butchers to neighbouring tanneries, which are often severely injured, and sometimes ruined for use, by warble perfora-

tion. I particularly wish to draw attention to the circumstance that the deaths of cattle, the hides of which are in such a state of what is well called "rottenness" as to justify the belief that they have died from warble sickness (that is, from the effects of the general ulceration, inflammation and other disorder of the hide, on the system), are often ascribed popularly to internal illness.

Early in the past season I was desired by various leading butchers and representatives of the trade to procure a report from



Fig. 7.—Piece of under side of warbled hide; warbles about half size.

some known authority as to the cause of the condition of the surface of the carcass, often to be found beneath badly warbled hide, and commonly known (from the belief that it is caused by the cattle licking themselves) as "licked beef," and to publish the results.

This I have done in the form of a leaflet, of which some copies have been distributed by the Society, and many thousands by myself; and as I am happy to forward this and the companion leaflet on warble attack and the simple measures found serviceable for its prevention and cure to all applicants, it is not desirable to take up

space here with details, beyond a few words as to the nature of the appearances known as "licked beef" or "jelly."

These were found by last year's examinations to be the result of inflammatory action caused by the maggot presence in the overlying portion of the hide. The figure on page 183 shows the appearance of the under side of a piece of infested hide when the maggots are as yet only partly grown. It is impossible in a wood engraving to convey the loathsome appearance of a maggot-infested hide when the pests are full grown, and showing through or breaking through the coating of their cells filled with putridity.

The affected portion of the surface of the carcass commonly called "licked beef" may be generally described as of a greenish-yellow colour and flabby appearance, with a frothy discharge oozing from the surface after being exposed for some hours to the air, and the jelly-like matter on the surface, which necessarily must be cleared away, or pared down to a depth which will allow the beef to be saleable, is a cause of great loss to butchers during the warble season. In the words of the manager of one of our great hide companies, "In the worst part of the warble season I could get you bucketfuls of inflamed tissue (commonly called by the butchers 'jelly') cut and scraped from the carcass after the hide is taken off. The formation of this matter must be a great drain on the health, condition, and quality of the animal, and must be a great loss to somebody."

This matter is being heartily taken up in various places by the Butchers' Associations as one requiring attention, and they are assisting me in circulating the leaflets above mentioned, showing the certain and simple means by which the warble attack may be to all practical purposes stamped out, a point which has been still further confirmed during last year by the large number of reports of success which I have received from cattle owners and farmers of Great Britain and Ireland.

ELEANOR A. ORMEROD.

ANNUAL REPORT OF THE ROYAL VETERINARY COLLEGE

*On Investigations conducted for the Royal Agricultural Society
during the year 1889.*

THE past year was remarkable on account of the unusual prevalence of parasitic diseases chiefly affecting sheep. Among lambs tapeworm (*Tænia expansa*) caused considerable losses. This parasite, the scolex, or hydatid, of which is unknown, infests the intestines in large number, sets up irritation, and causes acute diarrhoea, fre-

quently ending in death. The common bladder-worm (*Cœnurus cerebralis*), which infests the brain, causing the disease known as "gid," or sturdy, was also very prevalent in many parts of the country. The chief facts of the history of this parasite are perfectly well understood. The hydatid is the larval form of a slender tape-worm which inhabits the intestines of the dog and the fox. The mature segments of the worm, containing an immense number of eggs, are voided by the infested animals, and, falling on the pastures, are swallowed by the sheep which are grazing on them. The egg-shells being broken up allow the embryos to escape, and these minute creatures, by the aid of the hooklets with which they are armed, find their way to the brain, in which organ one or two of them undergo rapid growth and produce serious or even fatal disturbance in the great nervous centre.

Husk, or parasitic lung disease of young cattle and sheep, was very prevalent during the autumn, and caused the death of a large number of animals. The fatality, however, attending the affection was not so great as it has been in previous seasons, probably owing to the fact that it is now more commonly understood that, in order to avoid the serious results which follow the invasion of the parasites, it is even more important to support the system of the infested animals than to destroy the parasites in the lungs.

Several outbreaks of abortion among cattle and sheep were investigated during the year, but no opportunity was afforded of obtaining any morbid specimens, which were absolutely necessary for the purpose of endeavouring to isolate the organism on which the disease is said to depend. It was known that ergotised grasses were common in certain parts of the country, but in none of the cases inquired into was ergot found to be present in the pastures. The following record, which is the report of a visit to a herd of Jersey cattle, will convey an idea as to the kind of evidence which is usually obtained in inquiries concerning the origin of this disease :—

The herd in question consisted of 18 cows of all ages, 10 heifers, and a bull. All except the latter have been bred on the estate.

The soil is stiff clay, and the farm undulating. The land is well drained, and the larger portion of it is old pasture. That portion of it comprising the "park" is partly surrounded by a belt of trees, among which broom prevails to a considerable extent, and is known to be eaten by the stock. If, however, this plant was capable of producing abortion, it could not account for such cases as have occurred while the herd were housed. Although a careful examination was made of the pastures, nothing was found to indicate the presence of ergot in any of them. No reliable inference can, however, be drawn from this, inasmuch as the pastures were fed down closely, and the heads of such long grasses as were found in the hedgerows had been cropped off.

With respect to the food and system of management, there did not appear to be anything calculated to act prejudicially on the health of the herd or to disturb the function of gestation. The water was derived, for the most part, from a well, and, besides being used for stock purposes, was also employed for general consumption by many residents on the estate. When

at grass the supply was drawn from a small lake in one case, and from ponds fed by surface-drainage and springs in the others. It was ascertained that the mishap was not confined to animals at pasture, but also occurred to others while housed in sheds, which were planned and constructed with strict regard to sanitation. The management of the herd was in every respect as good as it could be made. Cows of all ages suffered from the disorder: but in this, as in most other outbreaks of this kind, the greater number of cases occurred in the younger beasts.

Referring to the influence of the sire in the production of abortion, it is interesting to notice that, in the eight years under consideration, 11 bulls were used in the herd. During this period 130 cows became pregnant, and 26 (20 per cent.) aborted. Looking at the number of cows served by each bull, it appears that of the 23 served by No. 4, 12, or over 50 per cent., slipped their calves, while of the remaining 113 cows only 9 per cent. of abortions remain, to be divided among five bulls, Nos. 5, 6, 7, 8, 9. Comparing one year with another, the greatest mortality appears to have prevailed in 1883, when, out of 15 pregnant cows, all of which were served by bull No. 4, 10 parted with their offspring prematurely.

In 1883 the same bull served 6 out of 11 cows which became pregnant. In this year three abortions took place, and of these two were credited to him. In 1884 two cows were served by bull No. 4, and neither of them aborted, while of twelve others sired by two bulls, Nos. 7 and 9 respectively, two aborted.

From these facts it appears that abortion has followed the services of a particular bull with remarkable frequency, so much so as to raise a strong *prima-facie* case against this animal as a possible cause of the mishap.

Numerous cases of actinomycosis were met with during the year, and in some cases the disease was found to be associated with general tuberculosis. Actinomycosis is very prevalent in certain localities in this country, being constantly found in all the fen districts and in river-valleys. There seems to be little doubt that it has a wide geographical distribution. A short time since, in a cargo of American cattle, 40 oxen were found to be affected with the disease in an advanced form, and in some of them the tumours (wens), immediately behind the angle of the lower jaw, were of enormous size.

A peculiar and fatal disease among cows, in a dairy farm in Staffordshire, was investigated recently, and the inquiry is still going on. The history of the case is as follows:—

With the exception of two cases last summer, the disease had only occurred during the *winter* months, when the cows were up in the sheds, and, with but few exceptions, all the animals attacked had died. The few cases which recovered were mostly those of animals purchased, and not bred on the farm.

At the time of this inquiry (July 27, 1889) all the animals on the farm were healthy and in good, thriving condition, so that no opportunity was afforded of seeing any of the symptoms of the disease. The food during the winter consisted of hay, grains from the Burton breweries, as well as cake and meal.

It was suggested that, should the outbreak again occur, it would be desirable to have a further investigation of the matter, when an animal affected with the disease could be seen and examined.

On October 28, 1889, another visit was made to the farm, information

having been forwarded that a cow was ill. She died the same day. The *symptoms*, as narrated by the veterinary surgeon in attendance, were as follows: Partial loss of appetite, increased frequency of pulse and respiration, without any marked alteration of character; diarrhoea was a prominent symptom. *Post-mortem*.—A careful examination was made by Mr. Duguid, who found the whole of the viscera presenting perfectly normal appearances. The stomach and bowels were free from any kind of congestion, and their contents of normal consistency. After spending about two hours in examining the carcass, he was unable to find any lesions to account for the animal's death.

In one case of the disease in a cow which was sent to the College, recovery followed the administration of small doses of dilute sulphuric acid with tincture of gentian. In a second case death occurred from septic poisoning, from retention of foetal membranes; and in a third fatal case poisoning by some corrosive substance was indicated. But analysis did not confirm this suspicion. An analysis of the water from a pond on the farm, and also from the main, did not lead to the detection of any organic impurities. Nor was anything discovered in the various food stuffs to account for the disease. In fact, up to the present, no conditions have been found which apply specially to the diseased cows, and it must be admitted that the problem has yet to be solved.

An outbreak of disease among deer in Suffolk and Dorset last year was made a subject of inquiry. The first cases were reported from Dorset by the veterinary surgeons in attendance, who considered the disease to be anthrax—an opinion which the post-mortem appearances seemed at first to justify. A portion of the spleen of one of the diseased animals was sent to the College, and subsequently the carcass of a deer was forwarded. Microscopic examination of the blood led to the discovery of numerous bacilli, which exactly resembled the organisms found in the blood of swine which had died after eating the offal of cattle or sheep dead of anthrax. Inoculation of guinea-pigs with the blood of the dead deer did not produce anthrax, nor did the bacilli, when cultivated in nutrient gelatine, grow in the characteristic form of the organisms of anthrax.

During the inquiry a suspicion arose that the deer were suffering from rabies; but the history that was given of the symptoms and progress of the disease did not support this view, and the test of inoculation of guinea-pigs with the spinal cord of one of the dead deer was followed by the death of the inoculated animals from septic poisoning, without any indications of rabies. It may, however, be remarked that recently a report has been received in which the symptoms described are decidedly suggestive of rabies. The inquiry was not completed on account of the difficulty of obtaining the necessary specimens. The illustrations figs. 1 and 2 (page 188) exhibit the bacilli found in the blood of the deer, and similar microbes in the blood of swine dead of anthrax.

The second case was reported to the College at the beginning of August. In this instance the fawns were chiefly affected. Specimens from some of the dead animals were sent to the College, and it was found on examination that the blood contained numerous bacilli identical in form with those which were discovered in the diseased deer in Dorset. Inoculation of sheep and guinea-pigs with the

blood of deer dead of the disease did not produce anthrax in the inoculated animals, although some of them died from septic poisoning. The disease among the fawns only lasted for a short time, and is stated to have ceased immediately after the addition of a few acres of fresh grazing-ground to the park in which the animals were feeding.

An outbreak of what seemed to be a similar disease among deer was reported from another part of the country, but the request for morbid specimens was not complied with, and no investigation, therefore, could be made.

An outbreak of parasitic lung disease (hoose) was investigated in a herd of beasts belonging to a gentleman in Essex. The malady in this instance occurred in milch cows, but the precise source of infection could not be ascertained.



Fig. 1.—Rods found in the blood of deer dead of a disease supposed to be anthrax.

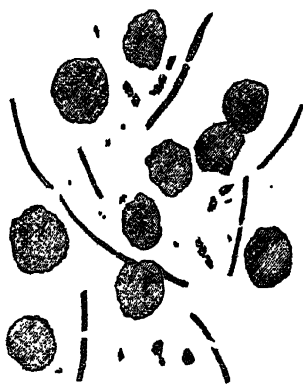


Fig. 2.—Rods found in the blood of swine which died after eating offal of cattle dead of anthrax.

In the advice given as to treatment it was recommended that all the affected animals should be housed and kept perfectly quiet. Good, nutritious food, with tonic and stimulating agents when required, was prescribed, and in the course of a few weeks the disease subsided without further mortality.

STATEMENT OF CASES OF DISEASED CATTLE AND SHEEP ADMITTED TO THE ROYAL VETERINARY COLLEGE IN 1889.

In January, two sheep suffering from "obscure skin disease," one lamb affected with "gid" (hydatids), one calf suffering from "parasitic pneumonia," and a cow supposed to be affected with "tuberculosis" were admitted into the College.

Upon a post-mortem examination being made in the last-named case, the walls of the rumen were found to be adherent to the walls of the abdomen over a considerable area, and, in the midst of an

inflammatory new growth, which united them together, were two large abscesses, elongated in a backward direction, and starting from the reticulum in front; in one of them was found a nail about $2\frac{1}{2}$ inches in length, besides a quantity of purulent matter. From this point a long sinus ran forward, and communicated with the reticulum, out of which the nail appeared to have passed. It is interesting to notice that in this case the nail was a blunt one, and did not (like others of a more penetrating character) enter the chest, but took a direction backwards.

During the year 23 cattle and 4 sheep were admitted to the College suffering from the following diseases:—

Actinomycosis	7	Suppurative stomatitis	1
Abortion	2	Tapeworm	2
Strongyles in lungs	2	Tuberculosis	1
Obscure skin disease	6	Dew rot	1
Hydatids in brain	1	Obscure disease	1
Down calving	3		

The number of morbid specimens from diseased cattle, sheep, and swine sent to the Veterinary College during the year 1889, were as follows:—

Traumatic pericarditis	1	Gastritis	1
Tubercular pericarditis	1	Gastro-enteritis	2
Cardiac abscess	1	Parturient apoplexy	1
Valvular disease (cardiac)	1	Intestinal hæmorrhage	1
Swine fever	26	Tumour	2
Pleuro-pneumonia	12	Joint disease in lambs	1
Anthrax	6	Parasitic diseases	3
Tuberculosis	3	Skin diseases	2
Diphtheria	1	Mammitis	1
Symptomatic anthrax	4	Abortion	1
Actinomycosis	5	Anæmia	1
Tubercular arthritis	1	Kidney disease	2
Septicæmia	1	Poisoning	1
Pneumonia	1	Poisoning (arsenical)	1
Parasitic broncho-pneumonia	6	Poisoning suspected	1
Bronchitis	2	Acute catarrhal gastritis	2
Broncho-pneumonia	3	Monstrosities	3
Pneumo-enteritis	1		

The following are the results of post-mortem examinations of animals that were sent in for investigation and died in the Infirmary:—

Parasitic pneumonia	1	Symptomatic anthrax	2
Actinomycosis	2	Hydatids in brain	6
Swine plague	1	Chronic diarrhoea	1
Tuberculosis	2	Skin diseases	2

EXPERIMENTAL INVESTIGATIONS.

Experiments were conducted during the year in reference to tuberculosis, blackleg, swine fever, the lung-worm, and the action of ergot

Tuberculosis.—It has been proved :—(1) That milk from tuberculous animals, when the udder is implicated in the disease and the milk contains tubercle bacilli, produces tuberculosis in rabbits. When the milk was given to the rabbits with their food the disease was confined to the digestive organs. The introduction of the milk under the skin produced general tuberculosis. The flesh of the cow from which the infected milk was obtained was given to rabbits without results. It has also been ascertained that by feeding on discharges from the human subject affected with consumption tuberculosis is induced in rabbits.

(2) That rabbits fed on tuberculous matter from the ox contract tuberculosis identical with that induced by feeding on tuberculous matter from the human subject.

(3) That oxen fed on milk, previously boiled, to which tuberculous matter from consumptive human beings has been added, contract tuberculosis which is apparently identical with that known as bovine tuberculosis.

Blackleg.—Experiments were carried on for some time for the purpose of testing the protective value of the modified virus of blackleg ; but the results up to the present time have not been such as to warrant the adoption of so-called protective inoculation in this disease. Inoculation with the dried juice of diseased muscle, attenuated by the method of M. Arloing, failed to protect the animals in many cases, and in several instances calves which had not been protected resisted inoculation with the dried spleen juice mixed with water, and a few calves resisted the injection of the muscle juice diluted with water. These results are important chiefly on account of the evidence they afford of varying degrees of susceptibility to the infection of blackleg.

At present the inquiry is being continued in the direction of the bacteriology of blackleg. A considerable number of organisms have been isolated from the fluid expressed from the diseased parts, and it is proposed to ascertain whether any of these organisms will produce the disease, with the ultimate object of using the same organism, after cultivation, for the purpose of protective inoculation.

Swine Fever.—Numerous experiments have been made for the purpose of ascertaining if any of the organisms which are found in the diseased parts in swine fever will produce the disease when given to healthy pigs ; but no positive results have yet been obtained. Fourteen distinct organisms have been isolated, but none of them produced any illness at all when given in considerable quantities to healthy swine, nor were any of the animals thus fed protected from the natural disease—in fact, they all died of typical swine fever when they were introduced into an infected sty. For example, it was found that the juice expressed from the lung, spleen, and intestine induced swine fever in healthy pigs which were fed with a small quantity of the fluid mixed with their ordinary food. The same results followed the feeding with spleen juice diluted with twenty times its bulk of water. But when the organisms cultivated from the diseased parts were employed for the feeding no disease

was produced, and the animals were not in any way protected from an attack of the natural disease.

The Lung-worm.—The investigation into the life-history of the lung-worm, which causes husk in calves and lambs, was continued during the year, and some very curious results were obtained, which for the purposes of this report may be summarised.

It has already been stated that the embryos of the lung-worm find a temporary habitat in earthworms, in which they undergo development. It is certain that at least three varieties of threadworms are entertained by these accommodating hosts, the earthworms and one variety, the anguillidæ, becomes sexually mature before being expelled by the worm. During the spring and summer months earthworms have generally been found to be free from embryos of strongyles, but, as soon as the husk appeared among sheep and lambs, the earthworms furnish embryos in abundance; the presumption, therefore, is, that after attaining a certain stage of development,



Fig. 3.—*Ova of freshwater snail found in intestine of Earthworm.*

the embryos have migrated or been expelled from the bodies of the earthworms, and remain among the roots of the grasses, ready to be taken up by calves and lambs grazing upon them. As soon as the lungs become invaded by the mature strongyles, eggs containing living embryos are expelled in large quantities, and are swallowed by the earthworms, in whose bodies they remain until they are sufficiently developed, when they are expelled, and live in the damp earth or in the roots of grasses, and are thus ready to produce another outbreak of disease in the following season.

Among the embryos of the threadworms, other organisms have been found in the digestive tubes of the earthworm, for instance the ova of a small freshwater snail as shown in the illustration (Fig. 3).

The Action of Ergot.—Some in-calf heifers were selected for these experiments, and, by a fortunate accident, one of them suffered from abortion before a single dose of the agent had been administered. Otherwise, had the experiments been commenced a few days earlier, it would have been difficult to avoid the conclusion that the ergot was the cause of abortion. The dose which was given to the experimental animals was a quarter of an ounce of the freshly powdered ergot daily for some time. Afterwards the dose was doubled, without any result whatever. One animal received a considerable quantity of ergotised grass, which was forwarded by Mr. Whitehead, but no disturbance of any kind was occasioned. Experiments are already on record in which enormous quantities of

ergot had been given without result to in-calf heifers, and it was therefore thought desirable in the above experiments to try the effect of comparatively small quantities. It is, of course, possible that there is some potency in ergot growing on living grasses which is absent in the dried specimens. In such case the point could only be determined by a series of experiments conducted on pastures in which a considerable proportion of growing grasses are affected with ergot.

G. T. BROWN.

QUARTERLY REPORT OF THE CHEMICAL COMMITTEE FOR MARCH, 1890.

THE Committee wish to draw the attention of the Council to the number of cases that have recently come under their notice of impure linseed-cakes branded and invoiced "95 per cent.," the word "pure" being omitted; and also to the prevalent disregard by Members of the recommendation of the Society, printed in the Appendix to the Journal, that all feeding-cakes should be guaranteed pure, and to be delivered in good condition.

They therefore recommend that forms of Contract Note and Invoice embodying the above conditions be issued to Members of the Society.

1. Mr. G. W. Goodison, of Coniston Bank, Coniston, Ambleside, sent on November 2, 1889, a sample of feeding-meal for analysis. He had purchased 5 cwt. of it, at 3*l.* 10*s.* per ton (in Liverpool), from a firm of corn merchants in Liverpool, stating that they guaranteed it to contain "nothing but the produce of wheat."

The analysis, returned on November 8, 1889, was as below:—

Moisture	12.27	} 100.00
Oil	2.95	
¹ Albuminous compounds (flesh-forming matters)	11.37	
Mucilage, sugar, and digestible fibre	51.32	
Woody fibre (cellulose)	10.82	
² Mineral matter (ash)	11.27	
¹ Containing nitrogen	1.82	
² Including sand	7.18	

This analysis, and a report which accompanied it, are referred to in the following correspondence:—

November 11, 1889.

GENTLEMEN,—As we experienced great difficulty in getting any of our animals to eat the meal you sent me last month, and which you guaranteed "to be nothing but the produce of wheat," I thought I would have the

same analysed, and I accordingly sent a sample for that purpose to Dr. Voelcker. On the other side you will find copy of his analysis, in sending which he writes as follows:—

“The meal contains a lot of refuse materials, and over 7 per cent of sand. It is very acid, and in a condition quite unfit for feeding-purposes.”

After your guarantee that the meal contained *nothing but wheat*, I should like to know what explanation you have to offer in connection with Dr. Voelcker's very damaging analysis.—Yours truly, G. W. GOODISON.

Messrs. —, Liverpool.

G. W. Goodison, Esq.,
Coniston Bank, Ambleside.

November 12, 1889.

DEAR SIR,—We are in receipt of your favour of yesterday, and note contents.

We are very much obliged to you for getting our meal analysed, but differ from you, as *we don't* consider the report at all damaging.

We repeat our meal is nothing but the produce of wheat, and if you go to the trouble of getting bran or any other wheat-offal analysed, you will obtain about the same result. It would never pay us to go to the trouble of mixing 7 per cent. of sand with the meal, and such an idea is preposterous. However, we think cattle consume a good deal more than 7 per cent. of sand and dirt with turnips and roots, without any ill effects. If you get linseed or other fancy cakes tested, we guarantee you will find they contain a certain percentage of *sand*. We cannot account for your animals not eating our meal; but we know this much, that customers have been ordering similar meal from us for years past, and all say it is the best value to be had, when used properly. Perhaps, if it were spiced up or sweetened with a *small* percentage of cheap molasses, like certain feeding-cakes selling at double, but not worth half, the price of our meal, it would go better. . . .

2. Mr. W. Large, of Taywell House, Goudhurst, Kent, sent on November 26, 1889, a sample of hair-greaves. He had purchased about $5\frac{1}{2}$ tons of it, at 45s. per ton, nett cash, delivered, and when applying for the analysis he wrote:—

“It was sold to me as hair-greaves, and guaranteed to contain 6 to 7 per cent. of ammonia and 14 per cent. of phosphates; but the bulk coming very different to sample, I refused to pay 45s. per ton as agreed, and shall be much obliged for your report of it.”

The following analysis was returned on December 3, 1889:—

Moisture	43.30	
1 Organic matter	36.58	
Phosphates	1.63	100.00
Carbonate of lime, &c.	16.58	
Insoluble siliceous matter	1.91	

¹ Containing Nitrogen, 2.56 = Ammonia, 3.11.

3. Mr. Thos. Stirton, agent for the Earl of Northbrook, Stratton, Micheldever, Hants, sent on January 15, 1890, a sample of linseed-cake for analysis. Ten tons had been purchased, at 8*l.* 13*s.* 9*d.* per

ton, delivered to Micheldever. The following was the analysis, sent on January 21, 1890.

Moisture	13.18	} 100.00
Oil	10.99	
¹ Albuminous compounds (flesh-forming matters)	24.01	
Mucilage, sugar, and digestible fibre	32.59	
Woody fibre (cellulose)	9.29	
² Mineral matter (ash)	9.04	
¹ Containing nitrogen	3.84	
² Containing sand	4.89	

This cake contains an excessive quantity of sand.

Mr. Stirton, in reply to inquiries, wrote as follows :—

"I may say that I bought the cake on the understanding that it was pure, and of high quality, although it is not invoiced as such."

The following correspondence ensued between the vendor and Mr. Stirton :—

T. Stirton, Esq., Estate Office, Stratton.

January 24, 1890.

DEAR SIR,—Thank you for letter to hand. The cake sent you was —'s best make, and is undoubtedly one of the best cakes in the market, notwithstanding chemist's report.

I do not consider a small sample sufficient to test the quality of any cake, and if two or three samples from any one bulk were sent up, and properly analysed, a different report would be given in each case; or, if same sample were sent to another analyst, result would not be the same.

The address of the firm is —, and I am sending them a copy of your letter, with analysis, and will give you their reply thereon. . . .

Copy of letter from Messrs. — :—

Mr. —.

London: January 25, 1890.

DEAR SIR,—We are exceedingly annoyed about the enclosed, as we have always, and we think justly, prided ourselves of the good quality of our — cake. In this case we may say at once that we have been deceived by the shipper. We bought 4 per cent. Calcutta, of which, and Bombay, our cake is invariably made; but we found, after a great many bags had been shot, that some of it contained more than 28 per cent. of dirt. It was too late then to stop the cake which had gone away, but the shooting of this dirty seed was at once stopped, and we are now having an arbitration on the matter. It is a most shameful affair, and whatever allowance we may get will never recoup us for the damage which our reputation will suffer from such a report as you have sent us. We may say that we did not know for more than a week after the cake was made and sent out that the seed contained such a large admixture of dirt, as it had not been analysed. We will show you on Monday samples of linseed shipped as 4 per cent. We shall, of course, be willing to allow your customer anything that he thinks he is entitled to under the circumstances. We will give you the letter containing the analysis on Monday, as we should like to show it, if you have no objection, to the gentleman who is going to represent us at the arbitration. We may add that we never had such a complaint before.—Yours truly,

(Signed) —.

In enclosing the above correspondence, Mr. Stirton wrote :—

“I am perfectly satisfied with their letter, and as they are willing to meet me I think, perhaps, it may be rather hard upon them to publish the error on their part.”

In answer to Mr. Stirton's letter, Mr. Voelcker replied :—

“I can only say that the makers should have taken the proper precaution of screening the seed before crushing it.”

4. Mr. J. Giles, of Bradford House, Kidderminster, sent a sample of cake on January 27, 1890 for analysis. Mr. Giles described the sample as “Oilcake” at 7*l.* 15*s.* per ton, delivered. In reply to inquiries, he said :—

“I certainly purchased it as a pure linseed-cake of the second quality. By this I mean a cake not containing the greatest amount of oil.”

The cake was invoiced, “—— Linseed Cake.” Five tons were purchased.

The following analysis was forwarded on February 11, 1890 :—

Moisture	13·43	} 100·00
Oil	6·39	
¹ Albuminous compounds (flesh-forming matters)	23·44	
Mucilage, sugar, and digestible fibre	32·72	
Woody fibre (cellulose)	18·39	
² Mineral matter (ash)	10·63	
¹ Containing nitrogen	3·75	
² Including sand	5·19	

A grossly impure cake.

The cake, it will be noticed, contains only a little more than 6 per cent. of oil, an excessively large amount of woody fibre, and over 5 per cent. of sand. It contained a large quantity of starchy impurities, and was very low in nitrogen. Amongst the impurities of the cake, rape, hemp, and earth-nut figured prominently.

Mr. Giles received the following letter from the vendor :—

John Giles, Esq., Bradford House.

January 31, 1890.

DEAR SIR,—The — Linseed-cakes are not a pure cake, but are made from the linseed as imported. The price of the — Linseed-cake, guaranteed 95 per cent. purity, is 9*l.* 10*s.* per ton, delivered at —.—Yours truly,

5. Mr. G. Taylor, agent for the Earl of Dudley, sent on February 7, 1890, from the Estates Office, Dudley, two samples of decorticated cotton-cake for analysis, stating that he had purchased the cakes as pure at the price of 5*l.* 17*s.* 6*d.* a ton (in Liverpool) for 6 tons. The analyses, sent on February 13, 1890, were as below :—

	No. 1	No. 2	
Moisture	9.48	5.59	
Oil	9.79	7.06	
¹ Albuminous compounds (flesh-forming matters) }	42.06	44.50	100.00
Mucilage, sugar, and di- gestible fibre }	24.86	27.81	
Woody fibre (cellulose) .	7.72	8.55	
Mineral matter (ash) .	6.09	6.49	
¹ Containing nitrogen .	6.73	7.12	

These cakes—especially No. 2—are very bad ones. They are hard, badly decorticated, and full of cotton-wool. I do not consider them fit for feeding.

6. Three samples of linseed-cake were sent from Norwich, King's Lynn, and Holkham, Norfolk, which were reported on as being mouldy, and unfit for feeding. The Committee draw attention to the above cases, from which it would appear that a considerable quantity of damaged, mouldy linseed-cakes have been offered for sale in Norfolk. Such damaged or mouldy cake is utterly unfit for feeding, and frequently positively poisonous.

Notes, Communications, and Reviews.

FRUIT-FARMING FOR PROFIT.

THE Worshipful Company of Fruiterers is principally known by its interesting annual presentation of magnificent fruit of all kinds to the Lord Mayor of London, and the accounts of this ceremony duly recorded by the Press. Recently, however, the Company has added to this graceful function, which has made it famous, the more practical and useful endeavour to extend and improve the cultivation of fruit in this country.

In the first place the Company is forming a fund for offering prizes for the best cultivated fruit farms under various conditions, and not long ago made an appeal to the Council of the Royal Agricultural Society for a contribution for this purpose. Although this application was not granted, as contrary to the practice of the Society, it was felt that the Council would be fully disposed to assist the Company with advice and with cordial co-operation.

Secondly, the Fruiterers' Company has helped on fruit cultivation by the publication of essays upon the subject. In 1883 an essay entitled "Profitable Fruit-farming" was widely circulated by the Company, describing the best methods of selecting, planting, and managing fruit trees and fruit bushes upon a large scale, and advocating the judicious extension of fruit cultivation by farmers.

Just recently another essay¹ has been published by the Company, who offered a prize of 25 guineas and a gold medal for the best essay on fruit-growing calculated to be useful to cottagers and small holders. There were fourteen competitors for this prize, which was won by Mr. Wright, well known as the assistant-editor of the *Journal of Horticulture*, and as the author of several publications upon horticultural subjects.

It will be considered that the issue of a practical work upon this subject is peculiarly well timed, as allotments are becoming general, and the facilities for obtaining them are so great that hardly any

¹ *Profitable Fruit-growing for Cottagers and Small Holders of Land.* By John Wright, F.R.H.I. Written for the Worshipful Company of Fruiterers.

working man in country districts need be without a plot of land. Having obtained the much coveted land, it is of the highest importance that the holders should be well informed as to the best systems of cropping it, and the most approved methods of management. Mr. Wright, in his prize essay, shows, by convincing instances, that fruit-growing pays small land occupiers remarkably well if it is properly conducted. He then goes on to describe by clear and feasible demonstration the measures and means to be adopted to ensure success.

Most farm labourers, and other labourers residing on the confines of towns where their work lies, have gardens with their cottages. Frequently the space is most limited, but, as Mr. Wright points out, there is room enough for a fruit tree or two, or for a few fruit bushes in most of them; and if well attended to, these will prove an important source of income. In fruit-growing localities cottagers with an apple tree or two, or a cherry tree, or a few plum trees, or damson trees, having, perhaps, gooseberry or currant bushes set under them, look to their fruit to pay their rent, or, at least, to produce enough to go a good way towards this. Even among these latter holders, though they live and move and have their being among fruit trees, there is considerable ignorance, which Mr. Wright's essay would tend to dispel. To those whose lot is not cast amid orchards and fruit plantations, who are ignorant, it may be, of the first principles of fruit culture, this work would be invaluable.

To give an example of "what can be accomplished by persevering effort with the provision wisely made in the form of fruit trees and bushes," Mr. Wright cites the case of a labouring man, earning from twelve to fifteen shillings per week, who had a garden of about the eighth of an acre in extent. This garden contained eight or nine apple trees, some of which he grafted with improved sorts. Under these were planted as many gooseberry and currant bushes and raspberry canes as possible, and strawberry plants on the margins. "This man died at the age of fifty, but left his widow in a position to open a small shop, and by carrying on the work he initiated she brought up her family, and orphan grandchildren as well, without any assistance."

Several other examples are given showing the importance of fruit production to small holders, and the plans and arrangements of typical gardens are detailed. Upon one plot of an eighth of an acre more than half was devoted to vegetables, yet there were on the other part six plum trees, six apple trees, two pear trees, eighty gooseberry and currant bushes, two long rows of raspberry canes, and marginal beds of strawberries.

After these striking illustrations Mr. Wright goes on to describe the best modes of treating each kind of fruit tree, fruit bush and plant suitable for small holdings. Raising, planting, pruning, manuring, and cultivating are explained in the most practical manner. Pruning is made as clear as possible by elaborate figures of stems, spurs, buds, and branches of fruit trees and bushes. Grafting and packing are also dealt with. In short, the essay is a complete

vade mecum, which should be in the hands of every occupier of a garden, or an allotment, who wishes to make the most of his holding.

The Fruiterers' Company holds, and most reasonably, that the fruit acreage of this country may be largely extended, and also that the cultivation and management of many of the existing orchards and fruit plantations should be greatly improved. Mr. Wright endorses this opinion, and believes that "if the cultivators of this country proceed on sounder principles and more intelligent lines, the time will come when we shall to a far greater extent than now, and far more creditably, share in providing our population with the most wholesome of food, which will be increasingly required—Fruit—the outcome of home effort and well-applied labour in British gardens and orchards."

CHARLES WHITEHEAD.

INFLUENZA IN HORSES.

UNDER an old name a new disease has lately attacked the people of this country. Influenza has been known among us and our horses from remote times as a form of catarrh. "An influenza-cold" has always been a term in common use to express a severe attack of nasal and bronchial catarrh, associated with much weakness.

The influenza which has come to us from the East—perhaps from China, through Russia, Germany, and France—has peculiarities, although it agrees with the old disease in some respects, especially in regard to the invariable depression, which its victims describe as most profound and distressing. It has also shown itself in the varying forms which have for so long been seen in horses. An attack of fever becomes complicated with disturbance of the digestive organs, indicated by vomiting and diarrhoea, with severe pain, the liver sometimes suffering, and also the kidneys. Congestion of lungs was a common and serious phase of the disease; and, among other things, loss of power to regulate the movements of the limbs was often a special feature in the attack. Medical authorities say that the lately-prevalent epidemic is a novel disorder in this country, both in regard to its extent and peculiar nature. The outbreak in 1847 is reported to have shown certain characters in common with the disease of 1889; but those who can speak from experience of both outbreaks, say that the first cannot be compared, in regard to its severity, with the last invasion.

Influenza among horses is not a novel disease. Early veterinary writers describe it as a malady affecting horses in numbers, and in some instances causing great mortality. The descriptions which have

been given of the affection generally include some reference to the sudden attack, the weakness and general exhaustion, with weeping eyes, sore throats, cough, and stiffness of movement, which are the well-known signs of the influenza of our own time.

Climatic influences seem to have little to do with the outbreaks of influenza which have been from time to time recorded. The horse-plagues of Egypt, the horse-sickness of South Africa, the horse-distemper of America, are, most probably, very closely related to the disease which has always been known in Europe. Their different degrees of malignancy may be due to the change of conditions in different parts of the world. In this country we are well aware that influenza may assume a malignant, or benign form, according to the system of treatment to which the sick animals are subjected.

While it is correct to say that horses suffer more or less from influenza periodically—in fact, a year seldom passes without the appearance of the disease in some districts—public attention is not attracted unless a severe outbreak occurs.

Nearly eighteen years ago alarming reports reached this country of the ravages of a fatal horse-distemper in America. The affection had spread, it was said, from some Canadian towns to the United States, and hundreds of horses died from the disease in the streets of New York. Reports from American veterinarians led to the belief that the disease was nothing more than the well-known influenza, and in a short time the fact was admitted by the Americans themselves. The fatality was traced to the maltreatment of the sick horses, which, in obedience to the spirit of competition, were kept at work in the cars until their powers of endurance were exhausted, and they fell to rise no more.

After a time, during which there was something like a panic among horse-owners in the affected districts, and an approach to the same mental state among horse-owners here, the urgent appeals from many veterinary surgeons in the States prevailed. Sick horses were properly nursed and tended, and the fatal distemper proved to be as easy to manage as it is in this country.

A few years after the outbreak of the American horse-distemper, another American novelty was announced, under the name of Pink Eye. Again English veterinarians recognised an old acquaintance—a form of influenza in which swelling of the eyelids and redness of the lining-membrane are the first, and often the most marked, symptoms. This time, however, we paid our cousins across the Atlantic the compliment of adopting their name for the disease, and since then we have had our outbreaks of Pink Eye, as we had long before under the more usual name of influenza.

During the recent prevalence of influenza among human beings, the friendly inquiry, Have you had it? was constantly made, and the reply was, too frequently, Yes! Another question, not so easily answered, was asked among medical men: What is it? A form of malaria, said some. Fever, undoubtedly, replied others. A protean disease, certainly, was the response from those who declined arbitrary definitions. Catarrh, pneumonia, nephritis, locomotor ataxy (loss of

control over the motions of the limbs)—in fine, a combination of the ills which flesh is heir to. Some, and, perhaps, most of those who had thought a great deal about it, had no reply at all to offer.

Exactly the same queries which were put, and differently answered, in regard to influenza of man, have been asked in respect to the disease in the horse :—What is its nature ? Does it spread by contagion or infection, or under the influence of some infecting atmospheric wave ? No satisfactory solution of the problem has yet been given. Practical veterinary surgeons hold quite opposite views on the question of contagion and infection, and facts in the history of the disease may be advanced to favour either view.

On all the points above referred to, valuable information has been communicated by the District Veterinary Surgeons attached to the Society. More than fifty reports were received from Bedford, Berks, Cambridge, Cheshire, Cornwall, Cumberland, Derby, Dorset, Durham, Essex, Gloucester, Herts, Huntingdon, Kent, Leicester, Middlesex, Monmouth, Northampton, Norfolk, Notts, Northumberland, Oxford, Rutland, Shropshire, Surrey, Somerset, Sussex, Wales, Wilts, Westmoreland, and York.

In some districts influenza has shown the usual catarrhal form, while in others no catarrhal symptoms were present. Pulmonary, biliary, and enteric complications were met with in many cases. Abscesses under the jaw, simulating strangles, existed in a few instances. Pink Eye was observed in comparatively few cases in the last outbreak. But most of the reports refer to the extreme depression which accompanies and follows the attack, and in some of them it is recorded that rheumatism was a common sequel, which considerably retarded the recovery of the patient.

All the reports agree in the statement that, under proper management, a fatal termination was quite exceptional. Good nursing, the administration of small doses of salines—as sulphate of magnesia—occasional employment of stimulating liniments to the throat and chest, and, in the convalescent stage, liberal rations, with tonics, constitute the favourite and successful system of treatment of influenza. Bleeding, purging, and blistering—the sheet-anchors of the medicine-man of the old school—are means which, in this disease, only tend to increase the prostration, and defeat the restorative efforts of Nature.

It may be asserted without any hesitation, that the outbreak of influenza among horses in this country in the Autumn and Winter of 1889 was in no way remarkable in comparison with previous great outbreaks in past years. The disease presented all the phases which have long been familiar to veterinary surgeons. In regard to the outbreak of the so-called influenza among men, the element of novelty was present in a high degree. In many of its features the disease of man closely resembled the malady of the horse, but there was nothing to justify even a remote suspicion that the two were communicable from the one subject to the other. It seems hardly worth while to suggest that both of the affections were probably due to some unrecognised atmospheric conditions. Nevertheless, there

is nothing more which can be said. Dr. Tyndall has told us something of the chemics and physics of the air we breathe, and it is no imputation on the science of the day to urge that something more has yet to be told. In our own organism, during the performance of the functions of life, we manufacture enough poison to kill us in a few hours, were it not for the aid of the excretory organs, which eliminate the deadly alkaloids and ptomaines from the living organisms as fast as they are formed. What equivalents of alkaloids and ptomaines are formed in the air under certain conditions, we know not—in fact, have not yet begun to inquire.

G. T. BROWN.

ARTHUR YOUNG'S TRAVELS IN FRANCE

THE notice of Miss Betham-Edwards's delightful book¹—delightful because it is little, and because it reproduces the charming language of a master of our tongue—must of necessity be brief, much more brief than one of Arthur Young's complete work. Indeed, the two differ in some material respects. The latter is scarce, costly, and cumbrous in the hand. It is a heavy quarto—thus asserting its claim to position "on the line" in the libraries of the last century—and, oh, glory to Suffolk! it was from a quiet press at Bury St. Edmunds, in MDCCXCII., that it fluttered forth, with its short preface of three pages. Miss Betham-Edwards's present reprint commences with an Editor's Introduction of twenty-two pages, and a Biographical Sketch of thirty more, the price of all which, with "The Travels," or, rather, so much of them as Arthur Young termed the "Journal," and his chapter on the Revolution of France, the buyer will not find costly. Perhaps it would have been more accurate if Miss Edwards's book had borne the title of "Arthur Young's Journal in France, and his Chapter on the Revolution"; for, in fact, out of the 566 pages of the quarto edition of "The Travels," no less than 250 are eliminated of matter relating to France, and 65 relating to Italy—that is to say, far more than half of the original work.

Everyone, however, will admit that what is given in the small volume is that which most interests the general reader, and that it is made doubly interesting by the editor's notes, which are as good and as instructive as might be expected from one so well acquainted with the map, literature, and history of France as Miss Betham-Edwards.

¹ *Travels in France by Arthur Young during the Years 1787, 1788, 1789.* With an introduction, biographical sketch, and notes, by Miss Betham-Edwards. 2nd edition. George Bell & Sons, 1889.

Her "Introduction," exhibiting, as it does, a picture of France as it is now in contrast with what it was 100 years ago, makes Young's descriptions, if possible, more startling ; while the present generation will acknowledge with gratitude the excellent memoir of a life and character of which little is generally known. There are in existence, as Miss Betham-Edwards explains, ample materials at Bradfield Hall for the production of a fuller memoir, and her kind host and hostess thoroughly deserve the thanks she gives them for placing these at her disposal. Revealing, as they do, the habits of the man—his failings as well as his virtues following in their varying phases year after year, as he committed them to writing—and exposing his very conscience, Miss Betham-Edwards's use of them has been made with singular judgment and good taste.

A comparison of the two title-pages—that of 1889 with that of 1792—shows at once the subjects omitted by Miss Betham-Edwards. That of the quarto volume runs thus : "Travels during the years 1787, 1788, and 1789, undertaken more particularly with a view of ascertaining the Cultivation, Wealth, Resources, and National Prosperity of the Kingdom of France." And it is these particular subjects, contained in part second of Young's Travels, in twenty-one chapters, which, as well as the maps, are not to be found in Miss Betham-Edwards's volume. They treat seriatim :—I. of the Extent ; II. the Soil and Face of the Country ; III. of the Climate ; IV. of the Produce of Corn, Rent, and the Price of Land ; V. of the French Courses of Crops ; VI. Irrigation ; VII. Meadows ; VIII. Lucerne ; IX. Sainfoin ; X. Vines ; XI. Inclosures in France ; XII. of the Tenantry and Size of Farms in France ; XIII. of the Sheep of France ; XIV. of the Capital employed in Husbandry ; XV. of the Price of Provisions, Labour, &c. ; XVI. of the Produce of France ; XVII. of the Population ; XVIII. of the Police of Corn in France ; XIX. of the Commerce of France ; XX. of the Manufactures of France ; XXI. of the Taxation of France ; and lastly, there is, in chapter XXII.—which Miss Betham-Edwards does reprint—"On the Revolution of France," a statement of "the cruel aggravation of the misery" of the mass of the people, which brought about the horrible, but not more cruel, obliteration of the monarchy, aristocracy, and grand seigneurs, to whose oppressions and atrocities these miseries were traceable.

Of these twenty-one chapters, all but four—viz., XVII., XIX., XX., and XXI.—are directly connected with, and illustrate, the agriculture of France. It is obvious, therefore, that the portion of the Travels relating especially to the cultivation of France, being omitted by Miss Edwards, cannot with propriety be here discussed in a notice of her book. The agricultural student loses by this curtailment ; but it should always be remembered, that while "the one leading and predominant object in view" with Arthur Young on these Travels "was agriculture, he conceived that he might throw each subject of it into distinct chapters, retaining all the advantages which arise from composing the result only of his travels." At the same time, he afforded the reader whatever satisfaction flows from the

diary form by the observations made on the face of the country, manners, customs, amusements, towns, roads, and seats, in the itinerary, which Miss Edwards has republished.

With a Quarterly Journal which will ere long, like a vampire, be sucking the brain of every available writer, the reprinting by the Royal Agricultural Society of England of the twenty-two chapters dealing with the leading and predominant object Young had in view is worthy of consideration. Should it be undertaken, the maps ought to be reproduced. A sight of them will at once suggest the advantage to the agricultural interest of preparing a selection on the same design for Great Britain. Arthur Young himself seems to have been aware of the usefulness of similar maps in his own country, as he issued some in the Agricultural Surveys published by the Board of Agriculture. We have abundance of splendid geological maps of Great Britain, but of surface maps next to none, if we except the "drift" maps of the Ordnance Survey of the eastern portion of England; and it is, after all, with the surface that the farmer has to do. A geological El Dorado of fertility may be below him at the depth of four feet, but if the space between that and the sole of his plough or the hoof of his live-stock be taken up by a layer of boulder clay, it might as well be on the other side of the world, for all the good it will do him.

If, therefore, what Miss Betham-Edwards has so admirably carried out in the republication and annotation of a portion of these Travels should lead to the complete reproduction of the work, with similar skill and care bestowed upon it, she will, indirectly, have rendered a great service to the readers of books worth reading, but which are not easily obtainable.

ALBERT PELL.

THE AGRICULTURAL HOLDINGS ACT.

*Note upon a Case relating to the Agricultural Holdings (England) Act, 1883, recently decided by the Queen's Bench Division of the High Court of Justice.*¹

It is proposed that the New Series of the Journal shall contain abstracts of legal decisions affecting agriculture, and notes on legal points which may be useful to the members of the Society. Fortunately for them, these notes and abstracts are not likely to be many or long, for the legal relations of the agricultural classes towards each other, and towards outsiders, are for the most part well settled; and if disputes arise, they are far more likely to be disputes of fact than of law. Occasionally, however, a dispute in-

¹ *Re Paul*—ex parte *Portarlington (Earl of)*, reported in vol. lix. of the *Law Journal Reports* (Q.B.D.), p. 30; and in the *Law Reports*, vol. xxiv. (Q.B.D.), p. 217.

volves a decision on some legal principle, or, what is more likely, requires the interpretation of an expression in some new Act of Parliament relating to agriculture. The case to which this Note refers comes within the last class.

Mr. Paul held a farm of some 1,223 acres in Dorsetshire under Lord Portarlington, as tenant from year to year, and, in accordance with the terms of the agreement under which he held his farm, he gave his landlord notice to determine his tenancy on Old Michaelmas-day (Oct. 11), 1888. Now, there exists a custom in that part of Dorsetshire in which this farm is situated which entitles a tenant who gives up his farm at Old Michaelmas to hold over some of the land till the 11th of the following February, and this custom was incorporated into the agreement under which Mr. Paul held his farm. On October 11, 1888, Mr. Paul quitted and gave up possession of about 1,000 acres, but continued, in accordance with the custom, to hold over some 200 acres of the land (about 120 acres pasture and 80 arable), till February 11, 1889, and certain buildings and premises till a later date.

On December 10, 1888—that is, two months before February 11, 1889—Mr. Paul gave his landlord notice, under the seventh section of the Agricultural Holdings Act, of his intention to claim compensation at the expiration of his occupancy of the farm, in respect of the use and consumption thereon of cake and other purchased feeding-stuffs and artificial manures, to the amount of about 2,200*l.*, and that he estimated a further expenditure of about 200*l.* on cake and other feeding-stuffs from that date to February 11 then next, when he should quit the portion of the land which he continued to hold over. And at the same time he appointed a referee to act for him. When Lord Portarlington received this notice, he declined to entertain it, on the ground that it ought to have been given two months before the determination of the tenancy by Mr. Paul on October 11, 1888, and that as it was not given within that time, it was of no effect.

Putting aside the technical form in which the case was brought on, as being of no interest or use to agriculturists, the question which the Courts—the Dorsetshire County Court in the first instance, and ultimately the Queen's Bench Division of the High Court—had to decide was this:—"Was Mr. Paul's notice of December 10, 1888 given 'two months at least before the determination of the tenancy,' within the meaning of section 7 of the Agricultural Holdings (England) Act, 1883?" Both Courts decided that the notice was given in time, or, in other words, that Mr. Paul's tenancy did not determine until February 11, 1889. The decision at first sight appears startling even to a lawyer, and still more so, I should imagine, to a layman; for one would naturally suppose that the tenancy determined for all purposes at the date at which the tenant gave notice of its determination—viz., October 11, 1888—and not at any other date; but it was not so decided.

It was submitted, on behalf of Lord Portarlington, that the notice of December 10, 1888, was rightly treated as a nullity, because it was

not delivered two months at least before October 11, 1888, when the tenancy was determined. That if the tenant's notice under the Act was to be delayed as this had been, no landlord would be safe, and his arrangements with an incoming tenant would be seriously prejudiced. That the Act does not permit the outgoing tenant to claim for improvements made after his notice has been given; but that if this notice was held to be good, the tenant would be able to assert a claim in respect of the land held over during an occupation of at least four months after his own determination of the tenancy of the whole farm. And further, that if the notice was good at all, it was so only as regards the 200 acres held over, and not as regards the 1,000 acres of which possession was given up on October 11 preceding. In spite, however, of these arguments, the Court, which consisted of Lord Chief Justice Coleridge and Mr. Justice Mathew, without calling upon counsel in support of the notice, held that it was good.

The Lord Chief Justice, after stating the facts of the case, and referring to the seventh section of the above-mentioned Act, is reported by the *Law Journal* to have given judgment as follows:—

“Now, this Act was passed by the Legislature with full knowledge of the kind of subject matter and sorts of contracts to be dealt with under it; and this very section, which gives the tenant a right to deliver a two months' notice of claim, gives the landlord an equal right to deliver a counter-notice of his intention to claim in respect of waste, or breach of covenant or agreement. So it was never intended that the landlord should be at the mercy of the tenant. It appears to me that the most just construction to place upon these words, ‘determination of the tenancy,’ is that they mean the end of the holding, which in the present case did not take place till February, 1889. This construction is equally fair for both parties, since it applies as much in favour of the landlord's counter-claim as of the tenant's claim. I cannot bring my mind to doubt but that these words do in reality mean the end of the holding; that is to say, the end of the time for which by custom—and here the custom formed part of the contract—the tenant retained possession of the land, even though he had given up a portion of his original occupation. Until the tenant had had the full benefit of the agreement, and of the custom of the country, he could not possibly tell what his claim would be. Therefore, to hold that a tenant in such a case as the present was out of time with his notice might give rise to cases of great hardship. Accordingly, I am of opinion that to give effect to the Act we must hold that these words, ‘determination of the tenancy,’ mean the end of the tenant's holding of the land.”

And Mr. Justice Mathew was of the same opinion, and said that he did not base it upon the facts or merits of the particular case before him. He quite agreed that the words in section 7 of the Act, “determination of the tenancy,” must mean the end of the entire holding.

So far as I am aware, no similar case has ever been brought

before the High Court in England, but it is worthy of notice that a very similar decision was given by the Court of Session in Scotland upon the corresponding clause of the Scotch Agricultural Holdings Act, 1883 (46 & 47 Vic., c. 62), upon very similar facts.

The case to which I refer is *Strang v. Stuart*,¹ in which the facts were that the tenancy expired at Martinmas as to the arable land, and at the following Whitsunday as to the houses and grass—a form of holding which, as I am given to understand, is by no means unusual in Scotland—and that the tenant, who had given notice to determine his tenancy in accordance with those terms, served his landlord with a notice of his intention to claim compensation under the Act four months before Whitsunday—four months being the period of time in the Scotch Act corresponding to the two months in the English Act. It was argued in this case that the notice ought to have been given four months before Martinmas, just as in the English case it was argued that the notice ought to have been given two months before Old Michaelmas; but the Scotch Court, like the English Court, decided that the words, “determination of the tenancy” in the Act mean the time when a total determination of the tenancy takes place, and accordingly held the notice good.

The decision of the Queen’s Bench Division in the case to which this note mainly refers appears to be of importance to landlords and tenants of agricultural land in England, because the custom of holding over some part or parts of a farm exists, not only in the part of the country in which Lord Portarlington’s farm is situated, but in many others. And again, the decision is of importance because it has been contended that the principle applies to those cases—almost universal throughout England—in which the right to use the barns and other farm-buildings, or part of them, for some time after what is usually spoken of and considered to be the end of the tenancy, is reserved to the tenant. How this point may be decided by our English Courts, if it should be brought before them, it would be presumptuous in me to predict; but I may observe that it has been decided in Scotland, by the Sheriff of Aberdeenshire, adversely to the above-mentioned contention.²

S. B. L. DRUCE.

SHETLAND PONIES.

THE movement now in progress for establishing a Stud Book for Shetland Ponies has been the means of directing a great deal of attention to them, and, consequently, anything said or written respecting the breed is of more than usual interest. It is most

¹ Reported in the 4th Series of the *Court of Sessions Cases*, vol. xiv. p. 637. A newspaper report may be found in the *Land Agents’ Record* for July 9, 1887.

² *Hannan v. Ramsey*, 1 *Sheriff’s Court Reports*, p. 236.

important that all that is written about the Shetland pony at the present time should be strictly true, and it is therefore desirable to point out a few of the errors made by the writer of an article on the subject which appeared in the January number of the *Cornhill Magazine*. To begin with, it is asserted that there is no such thing as the genuine Shetland pony, in the sense of a single pure and original breed; that the ponies in Unst, South Mainland, Fetlar, Fair Isle, and Bressay, are all different varieties; and that the pure-bred pony may be anything in height between 36 and 48 inches at the shoulder. Such statements as these are erroneous, but, unfortunately, contain just sufficient truth to render them misleading and dangerous.

Dr. Edmondstone, a well-known authority, and a native of Shetland, writing about the commencement of the present century, says: "The Shetland pony rarely exceeds 10 hands," and adds, "that the largest only are sold, the smallest being retained for breeding purposes." Having measured many hundreds of them, I am convinced that 10 hands is the average height, and that very few are found outside a range of from 9.2 to 10.2. An occasional specimen is met with as low as 8.2 when full grown, but anything under 9 hands is extremely rare, and the largest of the pure breed rarely exceeds 11 hands. All above 11 hands are crosses, and chiefly of two kinds, namely, those bred by Lady Nicholson in the Island of Fetlar, and those met with in the South Mainland district, known as Dundrossness. The Fetlar ponies were produced by the use of an Arab stallion which the late Sir Arthur Nicholson introduced about forty years ago; and the crosses thus established have been kept as a distinct breed ever since, and are known as "Fetlars." They range in height from 11 to 12½ hands. The Dundrossness ponies were produced by crossing the native breed with Orkney and Highland stallions. The system was begun by Mr. Bruce, of Sumburgh, and the late Mr. Grierson, of Quendale.

The ponies so bred are excellent, and well adapted for their work: they suit the residents in the South Mainland district, where good roads render the use of wheeled conveyances both practicable and necessary; but to call these ponies the ideal Shetland breed, as the writer in the *Cornhill* does, is absurd.

About fourteen years ago, I purchased from Mr. Bruce an Orkney horse about 15 hands in height, which had been used as a stallion in the district. The mere statement of the fact that a great many of the ponies are descended from him will show how much claim they have to be regarded as a pure breed.

These two districts excepted, all the other Islands adhere to the pure, original breed, and no one acquainted with the native pony can possibly fail to distinguish between it and the crossbred. It is a mistake to say that the Unst, Bressay, and Fair Isle ponies are all different. Of course, there are individual differences, but the general characteristics are in every respect alike.

The writer referred to says: "Extremes of size either way fetch correspondingly extreme prices." This is only true of the

smallest sizes, the larger-sized natives and the crosses being worth less than the medium heights of the native breed. He further says: "Strings of the ponies may be seen any day upon the roads, dragging peat fuel from the hills, in Lilliputian carts." This is true only of one district in all Shetland—namely, Dundrossness, and in no other Island or district does the practice prevail. He then goes on to say that "numbers of them live out of doors all the year round, except in the severest weather." Now, except in Dundrossness, the ponies live out of doors in all weathers, and it is merely the fact that the former are crosses, and therefore less hardy, that compels their owners to house them.

Again, it is stated that "snow often lies for seven or eight weeks covering the ground to a great depth." This statement is far from correct, as it is well known that the average winter temperature in Shetland is higher than that of any other county in Scotland, and the fresh winds from the Atlantic soon clear the ground of any snow that falls; this is equally true of the hills as well as the valleys.

Another point on which my experience differs is in regard to young foals. The writer says: "They are very delicate, and cannot safely be left out at night." Now, I have known them repeatedly dropped in cold weather in April with no shelter save a dry stone dyke, and in no single instance have I heard of them taking any harm in consequence. It is, no doubt, true that scanty feeding has a tendency to reduce the size, but it is quite possible, by careful selection and mating, to breed and keep them small, and at the same time to give them an ample supply of food. This has been conclusively proved on the Marquis of Londonderry's holdings in Bressay. There the ponies used for breeding purposes are not only small themselves, but have been bred from small parents; and though they get full feeding, the size has been gradually reduced, until now they rarely exceed $9\frac{1}{2}$ hands, and some of them are even two or three inches less.

Another point on which I must join issue is the following:—"Your Sheltie is not a quick animal, is inclined to be sleepy rather than otherwise, and is, as a rule, disposed to do no more than he can help in the way of exertion." Far from this being correct, I should describe the true Sheltie as a quick, lively animal, and not the least inclined to be sleepy or lazy. It is only crosses and starved specimens that have "a pensive, melancholy air." No animal of the horse kind can surpass a well-bred and well-fed Shetlander in brightness and energy. The assertion that the Iceland pony is quicker and livelier than the Shetland, is the very reverse of the truth.

To say that the purchaser of Shetland ponies will be victimised if he buys from agents in the South, is a gratuitous and uncalled-for assertion. I venture to say, without fear of contradiction, that if any one applies to a respectable dealer who is in the habit of importing them, he will be as fairly and honestly dealt with as he could possibly be were he to buy them in Shetland.

One more statement must be noticed. In a foot-note, the *Cornhill* writer says that "heather is now practically extinct in

the Shetlands." This proves conclusively that his acquaintance with Shetland is very limited indeed ; it may safely be asserted that one-third of the entire surface of the Islands is covered with it.

The foregoing is written in no controversial spirit, but merely with the intention of preventing the spread of erroneous impressions respecting a breed of ponies which only require to be known to ensure for them the high reputation they deserve.

R. BAYDON.

FRUIT EVAPORATION IN AMERICA.

I AM enabled, through the kindness of Mr. Michael Doyle, of Rochester, N.Y., U.S.A., to add some figures to those which appeared in a short article upon "Fruit-Evaporation in America," contributed to the Royal Agricultural Society's Journal by myself in 1888. (Vol. XXIV. 2nd Series, Part II.)

The western portion of New York State was there described as the home, *par excellence*, of the fruit-drying industry ; a district, lying within a radius of forty miles around the city of Rochester, N.Y., was designated as its centre ; and some particulars of the methods and cost of the evaporating process were given. But I was not then able to state definitely what quantity and value of evaporated fruit was produced annually in the area in question.

I now learn that during the year 1888 there was dried as follows :—

Kind of fruit	Weight in lbs.	Value in sterling
Whole, or ringed apples .	25,000,000	£ 225,000
Chopped apples . . .	8,000,000	30,000
Cores and parings . . .	4,000,000	12,000
Black raspberries . . .	750,000	30,000
Totals . . .	37,750,000	297,000

Two hundred and fifty millions of pounds (111,000 tons) of green apples, and two hundred and fifty thousand quarts of fresh raspberries were operated upon ; nineteen thousand tons of coal were burnt in fifteen hundred drying-houses, of various capacities, and forty-five thousand hands were employed, during four months of the year, in bringing about the above result.

What the olive is to Spain, the orange and lemon to Italy, the vine to France, and the fig to Syria, such is the apple to America. That portion of the United States lying between the thirty-eighth and fortieth parallels of latitude is the natural home of this valuable fruit. Nowhere else in the world, probably, does it attain to such perfection ; nowhere else is its cultivation so well understood, or

its quality and yield surpassed. Scarcely any fresh apples were exported from America before 1870, when the drying process was unknown, but a million barrels are now sent annually to Europe, where they compete successfully with home-grown fruit on account of their large size and excellent flavour.

But it is not only in western New York, or in apples and raspberries alone, that the business of fruit-drying is flourishing in the States. California, long known as a fruit-growing and fruit-canning State, has taken up the evaporative process during recent years, and is exploiting it with characteristic Western energy. In the genial climate of the Pacific coast, grapes, nectarines, figs, apricots, and peaches are cultivated to great advantage, and with these fruits,—more valuable than the apple, which, however, she also produces,—California is now entering the evaporated-fruit markets of the world.

During 1888 there was evaporated in California as follows :—

Kind of fruit	Weight in lbs.	Value in sterling
		£
Raisins	18,300,000	220,000
Peaches	4,600,000	92,000
Apricots	2,600,000	52,000
Prunes	3,100,000	43,000
Grapes	2,000,000	16,000
Nectarines	160,000	3,840
Apples	350,000	3,500
Figs	75,000	900
Pears	25,000	350
Totals	31,450,000	431,590

Raisins, it will be observed, form the largest item in this unique account of artificially dried fruit. These are rapidly supplanting, in the States, raisins of Spanish origin, and their production has increased from 120,000 lbs. in 1873, to 18,500,000 lbs. in 1888 ! This is, indeed, advancing by "leaps and bounds."

Peaches, which come next in value, would figure for a much larger sum, but for the fact that so many Californian peaches are canned.

It may be remarked, in passing, that western New York was once also a great peach-growing country, but a disease known as "the yellows," as deadly in its field of operations as the *phylloxera* itself, has desolated the peach-orchards of a region which otherwise would probably have doubled the value of its dried-fruit product, by adding an output of the more costly fruit to that of apples.

The figures show that the average value of Rochester evaporated fruit did not exceed 2d. per lb. in 1888, while the Californian product netted 3½d. per lb. all round—prices which sound low when it is borne in mind that it takes 8 lbs. of fresh fruit to make 1 lb. of evaporated apples. On the other hand, apple-rings sometimes sell for from 50s. to 60s. per hundredweight in the English market.

It is a suggestive fact that there were no fruit-drying factories in America fifteen years ago, and none in California ten years ago. In the latter case a trade of nearly half a million sterling has been added to the previously existing industries of the State, and created out of what was formerly for the most part waste, viz., the many tons of fruit which, in pre-evaporator days, rotted before they could reach a market.

Comparing the state of things, thus roughly disclosed, in two states of the Union, with what is being done to-day in our own country towards the culture, curing, and distribution of fruit, three things cannot be denied.

Aside from certain limited areas, of which the Vale of Evesham furnishes a good example, the culture of fruit is stationary in England, curing by artificial heat is practically unknown, and distribution is clumsy and costly.

Devonshire, for instance, our chief apple-growing county, has added only a few hundred acres to her orchards during the last ten years. Her trees are, for the most part, old, of poor sorts, bearing small and inferior fruit, often decaying and moss-grown. They stand close together, the grass grows thick between them, and they are cultivated much in the same way now as they were a century ago. Meanwhile, it probably costs a Devonshire man more to send his apples to Loudon than his American competitor pays for freight from New York or Boston to the same place.

If we ask ourselves, "Whence the contrast between the two countries?" I think the answer must be twofold—Americans, generally, are more alert than their English competitors, more quick to see, and seize upon, new openings for trade; while the American farmer is, in addition, a freeholder who cultivates his own soil.

Following the advice of a recent speaker on this subject, himself a scientific and successful fruit-grower as well as a landowner, I forbear from speculating on the question—"How far the fact of the American farmer being also an owner, has determined his greater success in this field of industry." But it must be remarked that the Vale of Evesham, already alluded to, where custom gives "the Gardeners," who are all tenants, not only an actual ownership of their improvements, but a practical ownership of the soil itself, is the site of a very prosperous fruit-growing industry, and the home of many well-to-do fruit-farmers. Is this due to sun, situation, and soil,—to three S's, or to three F's?

DAN. PIDGEON.

THE IMPROVEMENT OF THE ART OF HORSE-SHOEING.

HORSE-SHOEING as now practised in this country is generally admitted to be in a very backward state. The farriers as a body are sadly ignorant of the essential principles of their art, and valuable horses are often liable to be injured in consequence. The Worshipful Company of Farriers of London, who have recently been associated with the Society's Horse-shoeing Competitions, have just formulated an important national scheme for the improvement of Farriery by the examination and registration of shoeing smiths. The following are its chief provisions :—

(1.) The holding simultaneously throughout the country of theoretical and practical examinations in Horse-shoeing, and the registration of the successful examinees in a general register ; those gaining the certificates of registration to have the sole privilege of using after their names the letters R.S.S. (Registered Shoeing Smith).

(2.) The opening in connection with existing technical schools of classes for theoretical and practical instruction in the art of Farriery ; or, where no such schools exist, the provision of instruction by duly qualified persons.

(3.) The establishment of Apprenticeship Funds, out of which premiums may be advanced to apprentices, repayable during the currency of their indentures.

Farriers, whether masters or journeymen, established in the trade prior to the opening of the register need not necessarily undergo examination, but may be registered on satisfactory proof of their fitness according to circumstances.

To carry out these provisions, it is proposed to appoint a General Registration Committee in London, consisting of ten Members of the Worshipful Company, six Members of the Royal Agricultural Society, six Members of the Royal College of Veterinary Surgeons, two Members of the Amalgamated Farriers' Union, and a limited number of representatives from subscribing public bodies. For country districts the scheme will be applied by Provincial Committees, subject to the control of the General Registration Committee in London. The whole scheme, having been carefully revised by a joint conference of representatives of the Royal Agricultural Society, the Worshipful Company of Farriers, and the Royal College of Veterinary Surgeons, has now received their final approval ; and all that is required in order to insure its success is the practical sympathy and support of the public, which it is proposed to ask for at a meeting at the Mansion House to be held in the spring. There is no doubt that the scheme, if properly worked, will import a healthy competition into the trade of Farriery, will

supply horse-owners with efficient farriers whose work can confidently be relied upon, will save the feet of many valuable horses from careless or clumsy manipulation, and will be a decided step towards the technical education of an important body of craftsmen.

CHARLES CLAY.

HEREDITY.

THOUGH the conception of heredity is far from being new, the subject has recently been again brought prominently to the front, and is at present one of the most widely-discussed of biological problems. It has a special attraction and a peculiar interest for the agriculturist; for whether his object be the improvement of live-stock or the improvement of plants, the principle of heredity is that which must direct his efforts.

In the recent developments of the problem, no investigator has imparted to the subject of heredity a greater interest, or endowed it with a higher fascination, than Dr. Weismann. His recently published work¹ on this subject is made up of a series of eight essays, arranged in the order of their original publication, from 1881 to 1888. They deal with the following subjects:—(1) the duration of life, (2) heredity, (3) life and death, (4) the continuity of the germ-plasm as the foundation of a theory of heredity, (5) the significance of sexual reproduction in the theory of natural selection, (6) the number of polar bodies and their significance in heredity, (7) the supposed botanical proofs of the transmission of acquired characters, and (8) the supposed transmission of mutilations. Here is evidence of a sufficiently varied programme to afford any author an opportunity of showing a many-sided knowledge of the phenomena of life. One of the great charms of Darwin's works is their wealth of facts; and if Dr. Weismann does not quite reach the standard in this direction of the great English naturalist, the reader is, nevertheless, bound to acknowledge the copiousness of illustration with which this volume is adorned.

Heredity is defined as "that property of an organism by which its peculiar nature is transmitted to its descendants. From an eagle's egg, an eagle of the same species develops; and not only are the characteristics of the species transmitted to the following generation, but even the individual peculiarities." The offspring resemble their parents among animals as well as among men." But the mind demands more than a mere definition, and Weismann endeavours to supply this, his argument being somewhat as follows:—

Certain minute organisms of very variable size occur in stagnant water, in mud, in damp earth, and elsewhere, and are frequently to be obtained by infusing any animal matter in water, and

¹ *Essays upon Heredity and Kindred Biological Problems.* By Dr. August Weismann. Authorised Translation, edited by Edward B. Poulton, Selmar Schönland, and Arthur E. Shipley (Oxford: Clarendon Press, 1889).

allowing it to evaporate while exposed to direct sunlight. One of these organisms, seen under the microscope, has the appearance of a particle of jelly, and usually is continually changing its shape; hence has been given to it the name of the *Proteus Animalcule*, or *Amœba*. One of the most striking phenomena associated with *Amœba* is the manner in which it produces fresh *Amœbæ*. The individual *Amœba* is a single cell—it is an unicellular organism—and, by its simply dividing into two, a couple of *Amœbæ* come into existence where before there was only one. Neither of these new cells produced by the process of fission—as it is termed—can be regarded as the parent of the other, and, in due course, each of the new *Amœbæ* will in turn undergo fission, and give rise to a still younger generation. It is possible, then, that in looking at an *Amœba* we may be gazing upon something which has been continuously living from the time when life first appeared upon the globe, and the question, Is *Amœba* immortal? is by no means chimerical. Weismann says:—

“The process of fission in the *Amœba* has recently been much discussed, and I am well aware that the life of the individual is generally believed to come to an end with the division which gives rise to two new individuals, as if death and reproduction were the same thing. But this process cannot truly be called death. Where is the dead body? What is it that dies? Nothing dies; the body of the animal only divides into two similar parts, possessing the same constitution. Each of these parts is exactly like its parent, lives in the same manner, and, finally, also divides into halves. As far as these organisms are concerned, death can only be spoken of in the most figurative sense.”

Not *Amœba* alone, then, but the low, unicellular water-plants, and even highly-organised unicellular structures, such as the Infusoria, never die. They may be destroyed by heat, poisons, &c., but they none the less carry in themselves the potentiality of unending life—“death which arises from internal causes is an impossibility among these lower organisms.”

Next are discussed the multicellular plants and animals—that is, all those organisms which consist of more than one cell. It is pointed out that the constituent cells came to be divided, in the individual organism, into two groups—the somatic (Gr. *soma*, the body) and reproductive; in other words, the cells of the body, as opposed to those which are concerned with reproduction. As the complexity of the body increased, the two groups of cells became more sharply separated from each other.

“Very soon the somatic cells surpassed the reproductive in number, and during this increase they became more and more broken up, by the principle of the division of labour, into sharply-separated systems of tissues. As these changes took place, the power of reproducing large parts of the organism [*e.g.*, the lobster its claw, the salamander its tail or foot, the snail its horns, &c.] was lost, while the power of reproducing the whole individual became concentrated in the reproductive cells alone.”

Another step in the argument is based upon a consideration of the necessity for division of labour amongst the cells of an organism consisting at first of a colony of similar cells:—

"Division of labour would produce a differentiation of the single cells in such a colony: thus, certain cells would be set apart for obtaining food and for locomotion, while certain other cells would be exclusively reproductive. In this way, colonies consisting of somatic and of reproductive cells must have arisen, and among these, for the first time, death appeared. For in each case the somatic cells must have perished after a certain time, while the reproductive cells alone retained the immortality inherited from the Protozoa" [Amœbæ, Infusoria, &c.].

One more extract must suffice to indicate, in this brief manner, the direction of Weismann's argument. Premising that by "germ-plasm" he means "the reproductive substance," he says:—

"We have an obvious means by which the inheritance of all transmitted peculiarities takes place in the *continuity of the substance of the germ-cells or germ-plasm*. If, as I believe, the substance of the germ-cells—the germ-plasm—has remained in perpetual continuity from the first origin of life, and if the germ-plasm and the substance of the body—the somato-plasm—have always occupied different spheres; and if changes in the latter only arise when they have been preceded by corresponding changes in the former, then we can, up to a certain point, understand the principle of heredity; or, at any rate, we can conceive that the human mind may at some time be capable of understanding it."

And it is concluded, "that heredity depends upon the continuity of the molecular substance of the germ from generation to generation."

There exists at the present time no more warmly-controverted doctrine than that concerning the transmissibility of acquired characters. Weismann's definition of an acquired character is not very satisfactory, but here it is:—

"An organism cannot acquire anything unless it already possesses the predisposition to acquire it; acquired characters are, therefore, no more than local, or sometimes general, variations which arise under the stimulus provided by certain external influences."

He is quite opposed to the idea that acquired characters are transmissible, and on this point finds himself at issue with some of the most prominent of our English biologists. His argument is:—

"If—as it seems to me—the facts of the case compel us to reject the assumption of the transmission of acquired characters, there only remains one principle by which we can explain the transformation of species—the direct alteration of the germ-plasm, however we may imagine that such alterations have been produced and combined to form useful modifications of the body."

Many of the illustrations are of great interest. The main root of a plant, it is argued, has not acquired the power of growing perpendicularly downwards under the stimulus of gravity because this force has acted upon it for numberless generations, but because such a direction for such a part was the most useful to the plant. Can it be supposed, it is asked, that the brown scales which form the characteristic protective covering of winter buds have been produced by the direct action of the cold? The fact that Hoffmann succeeded

in producing the garden pansy from the wild form, *Viola tricolor*, in the course of eighteen years, is regarded as proof of a change in the germ-plasm.

It is admitted that a small number of observations made upon man and the higher animals seem to prove that injuries or mutilations of the body can, under certain circumstances, be transmitted to the offspring. A cow which had accidentally lost her horn produced a calf with an abnormal horn; a bull which had accidentally lost his tail, from that time begat tailless calves; and so on. The great difficulty in dealing with such cases arises from their doubtful authenticity.

To sheep-breeders there is a certain *naïveté* about the following statement:—

“Professor Kühn, of Halle, pointed out to me that, for practical reasons, the tail in a certain race of sheep has been cut off during the last hundred years, but that, according to Nathusius, a sheep of this race without a tail, or with only a rudimentary tail, has never been born. This is all the more important because there are other races of sheep in which the shortness of the tail is a distinguishing peculiarity. Thus, the nature of the sheep’s tail does not imply that it cannot disappear.”

Another illustration is afforded by the rook, which digs into the earth in its search for food, and in this way the feathers at the base of the beak are rubbed off, and can never grow again because of the constant digging. Yet this peculiarity, which has been acquired again and again from time immemorial, has never, it is said, led to the appearance of a newly-hatched rook with a bare face.

Since the death of Darwin, no such important questions have been raised as those in this volume; and though, to the younger school of English biologists, Weismann’s conclusions may appear inconsistent and contradictory, yet his researches cannot fail to exercise an influence on the future development of biological science.

Many of the illustrative cases cited are of extreme interest. As regards the duration of life, the horse and bear attain an age of 50 years at the outside; the lion lives about 35 years, the wild boar 25, the sheep 15, the fox 14, the hare 10, the squirrel and the mouse 6 years. On the other hand, whales live for some hundreds of years, and elephants for 200 years. The long life of birds is regarded as a compensation for their feeble fertility and for the great mortality of their young. Much information of direct value in devising means for coping with insect-pests is discoverable in the pages on duration of life in insects, the general rule being enunciated, that this duration is directly proportional to the number of eggs and to the time and energy expended in oviposition. That the saw-flies, so familiar to us as destructive pests, were the probable ancestors of bees and ants is a circumstance of high interest. The duration of the larval life in insects is determined chiefly by the nature of the food, and the ease or difficulty with which this can be procured. The larva of the bee becomes a pupa in five to six days; but then it is fed with materials (honey and pollen) of high

nutritive value, and requires no great effort to obtain its food, which lies heaped up around it. The larva of the blow-fly becomes a pupa in eight to ten days, although it moves actively in boring its way under the skin and into the tissues of the dead animals upon which it lives. The life of the leaf-eating caterpillars of butterflies and moths lasts for six weeks or longer, corresponding with the lower nutritive value of their food and the greater expenditure of muscular energy in obtaining it. Caterpillars which live upon wood have a larval life of two or three years. There is, however, no essential relation between duration of life in the larva and in the mature insect—it does not follow, for example, that, if the larva is long-lived, the mature insect is necessarily short-lived. The life of the mature insect (the imago) is generally very short, and ends with the close of the period of reproduction, which is itself extremely short.

"The shortest life is found in the imagos of certain May-flies, which only live four to five hours. They emerge from the pupa-case towards the evening, and as soon as their wings have hardened they begin to fly, and pair with one another. Then they hover over the water; their eggs are extruded all at once, and death follows almost immediately."

A principle of great importance is embodied in the following words:—

"Insects belong to the number of those animals which, even in their mature state, are very liable to be destroyed by others which are dependent upon them for food; but they are, at the same time, among the most fertile of animals, and often produce an astonishing number of eggs in a very short time. And no better arrangement for the maintenance of the species under such circumstances can be imagined than that supplied by diminishing the duration of life, and simultaneously increasing the rapidity of reproduction."

The phenomenon of parthenogenesis (virgin birth), as witnessed in aphides and other insects, is treated at considerable length; and it is, indeed, scarcely possible to turn to any page of this fascinating work without finding something to arrest the eye and to exercise the mind.

The great interest which Weismann's essays have excited throughout the scientific world affords high testimony to their inherent merits. The problems which he has formulated are of profound significance, and it is not out of place to suggest that stock-breeders possess many and exceptional advantages for making solid additions to the storehouse of facts in this department of scientific inquiry. Such excellent work has been done in this country in the improvement of the breeds of farm-animals that it seems deplorable that the men, whose keen eye and subtle touch have achieved results of world-wide fame, should have gone to the grave and left no written record behind them. If any breeder would accurately and honestly record all his successes and all his failures—especially the failures—in the mating of selected animals, he would in time compile a history of inestimable value. The work would need to be done with the most scrupulous exactitude, and the most rigid control of every observation. But, besides adding to the sum-total of useful know-

ledge, such an observer would confer an immense benefit upon himself; for—to employ Weismann's words—"it is the quest after perfected truth, not its possession, that falls to our lot, that gladdens us, fills up the measure of our life, nay! hallows it."

W. FREAN.

MARKET-GARDENING IN THE SCILLY ISLANDS.

THE general features of the agriculture of the Scilly Islands have already been described in the article by Messrs Laurence Scott and Harry Rivington which appeared in the *Journal* for October, 1870 (Vol. VI. 2nd Series, pp. 374 *et seq.*). In those days the cultivation of early potatoes "formed the main support of the Scillonian farmer," and great things were expected of the trade. It is a curious instance of the changes of agricultural conditions caused by foreign competition and the opening up of new sources of supply, that although the growth for export of early potatoes is still an important industry of the Scilly Islands, it has now been superseded in the financial esteem of the farmers by the cultivation of flowers for Covent Garden Market. Last season no less than 200 tons of cut flowers were forwarded from the Islands to the various markets of England and Scotland by the steamer which plies between Scilly and Penzance, and in a single week of February in this year 20 tons were despatched. Nearly 100 acres in the Islands are devoted to the culture of the Narcissi, and the capital invested in this trade is reckoned at something like 250,000*l.* The following details—collected during a recent visit—of the cultivation of the soil in the Islands, as at present conducted, will, it is hoped, prove of general interest.

General husbandry was never very successful in the Scilly Islands, for up to the time of Mr. Augustus Smith's proprietorship the farmers held their land on such precarious tenure that they refrained from all improvements, and contented themselves with growing a little corn and a few potatoes, and breeding inferior cattle and sheep. Notwithstanding the introduction subsequently of improved cattle, securer tenures, and larger holdings, farming, strictly so called, failed of ultimate success. It was then that market-gardening stepped in, and for a long time proved exceedingly remunerative. The cultivation of the early potato was one of the chief supports and occupations of the Scillonians; and every available space was planted with it.

It was while the growers were in the flood-tide of this prosperity that the Lord Proprietor, looking ahead, recommended the Scillonians to turn part of their attention to the cultivation of the flowers which grew on the islands for Covent Garden Market. The

majority were disinclined to give up potatoes for flowers in ever so small a degree; but one farmer thought over Mr. Smith's suggestion, and collected some of the flowers growing on his ground. He sent the little lot to London, on which he cleared 2s. 6d.; and this was the beginning of the floriculture in Scilly, which has now reached giant proportions.

Just about the time that the last report of these Islands was printed in the *Journal*, the Scillonians were brought more into touch with the mainland by means of a steamer which was started to run between the Islands and Penzance, and by means of a telegraphic cable between the two. Thus the potatoes found a quick market, and the growers were kept informed of current prices. For the first fruits of the potato crop—generally in May—as much as 1s. 6d. a pound has been received. Gradually the inhabitants were encouraged and stimulated to grow various new vegetables, and asparagus, seakale, parsley, and tomatoes were added to those sent to market.

The growers had their anxieties and troubles then, even as now—the exposed situation of the Islands, and the lack of woods and trees, to provide natural protection to their fields from the biting winds and heavy gales which sweep over the land, gave them many a night in “the open,” keeping up fires round the fields to preserve the budding potatoes.

It was this need of protection to their plants which caused them to supersede the loose, stone divisions of land by planting laurel, escallonia, and other picturesque shrubs for hedges. This planting of hedges was, indeed, the foundation and preparation of the new development in the farming of the Islands. To-day the land is no longer given up solely to the growing of potatoes, parsley, asparagus, and seakale, for a large proportion is devoted to floriculture—a combination which has answered well in every way. The result may be seen in the absence of poverty, in the quiet, unobtrusive independence of the people, in the improved outhouses on the farms, and in the possession of better farming-implements. The people are neither so rich nor so poor as they have been (it was a proverb, “Either a feast or a famine in Scilly”), their life is freer of excitement than it used to be, and they seem to have fallen into the happy medium of comfort and content.

Last season the following supplies were sent from the Islands to the various markets on the mainland by the steamer plying between Scilly and Penzance:—

- 46,000 pads of fish (a pad is 50).
- 200 tons of flowers.
- 800 tons of potatoes + 230 tons sent by boats and smacks.
- 150 tons of other vegetables.
- 3 tons of seakale, from St. Mary's alone.
- 5 tons of tomatoes.

The expense of carriage is 11s. per cwt. to Scotland, and 7s. 6d. to Covent Garden. The salesman's charge is 10 per cent. if he supplies boxes, and 7½ if he does not.

It would be difficult to find land anywhere so bursting with life and growth as that of the Scilly Islands; and were it not for the occasional want of rain, and the too great prevalence of gales, there would be no limit to its productiveness. The temperature is never intensely hot in Summer, nor intensely cold in Winter.

The soil of the Islands is composed mostly of decomposed granite and peat; here and there it is as black as soot. The very rich land seems to run in veins, while other has good rich soil for some distance down, till it touches the cold white clay. The soil is very loose, and drinks greedily every drop of rain: it will not refuse "a shower every day, and two on Sundays." The rainfall is quite different here from the mainland: the average in Middlesex is 24 inches, in Scilly 31 inches, and in Cornwall it is 44 inches. Scilly would be glad of an inch a week. The soil, good as it is, lacks phosphate of lime and ammonia, both of which can, fortunately, be supplied in a great measure by the seaweed-manure.

The method here of making seaweed-manure is to make a bottom, or foundation, of earth. On this the seaweed is spread, and covered with a layer of sand; after a month or two, the juices have penetrated the earth, which is then ready to be carted away, and laid on the soil. The people use a peculiar-looking instrument for cutting through the seaweed-manure. It has a blade 8 inches long and 7 inches wide. If the seaweed be driven in when potatoes are to be planted, it is put straight on the earth, and often worked in by the plough, and the potatoes¹ planted in at once; then the soil and seaweed mixed are turned over on the potatoes. In Scilly the potatoes are planted much nearer the surface than on the mainland; if they were so planted on the "main," they would be destroyed by frost.

Kelp-making was once an industry here to a large extent, but it has completely died out. Masses of seaweed were cut from the rocks, and dried. It was then cast into large pits, and burnt until it was reduced to a liquid state, when it was stirred with long iron prongs, and allowed to cool. The agent used to take it off the people's hands for rent, and ship it to the soap-boilers on the mainland at a considerable profit. After a time, however, it became adulterated with sand; and this, with the discovery of other alkalies, destroyed the sale altogether.

The surface is divided into farms, some large, some small.

	Population	Acres	Number of Farms.
St. Mary's, the largest island, contains .	1,200	1,527	52
Tresco is farmed principally by Mr. Dorrien Smith, the Lord Proprietor.	325	823	3
There are, beside, one or two small farms on it			
Bryher contains	103	300	17
St. Martin's contains	175	520	22
St. Agnes contains	148	300	14
Total	2,041	3,500	108

¹ Potatoes planted in fresh seaweed are waxy.

Out of the 3,560¹ acres—which are the figures of the last Government survey—2,242 are tillable or improvable.

Every farmer is, more or less, a flower-farmer; but the larger ones grow also potatoes, seakale, asparagus, and tomatoes for the markets, as well as flowers. They keep a small number of cattle and sheep and grow corn, but only sufficient for home use. They make their own butter, and keep poultry. But of all these last nothing is exported—they have sufficient only for home consumption. The butter is exquisite, and would be gladly bought on the mainland, if it could be spared; and the same may be said of the fruit, which is grown principally at Rocky Hill and Holy Vale: it is excellent, but only sufficient for home use, and, moreover, the apples are too mellow to bear packing.

St. Mary's has an area of 1,527 acres, most of which is under cultivation. The largest farmer owns 70 acres of cultivated land. Eight of these are devoted to flowers, and 10 to potatoes. He grows no other vegetable but a large quantity of mangels. He owns 28 head of cattle, 3 horses, and 14 sheep.

The cultivation of flowers has not reduced the amount of potatoes grown so much as one might think, and for this reason—every foot of land formerly waste, capable of cultivation, is laid under tribute for the flowers.

An average-sized farm is held by a gentleman who farms 36 acres of tilled land and 105 acres of common or waste land. Four or 5 acres are planted with flowers, and about 7 with potatoes. He has 20 horned cattle and 20 sheep. He grows enough corn to feed the cattle, and the grazing-ground is contained in the 36 acres. Seaweed is, he considers, by far the best manure for asparagus. Tomatoes have so gone down in price that 9d. per pound is the price during December, January, and February. In planting he would use about 25 cwt. of seed-potatoes to an acre, and he would consider between 4 and 5 tons an acre a good return. His preparation of the ground for receiving potatoes is to well press it, and plough it, and dress it twice with seaweed and compost, the latter consisting of road-scrappings, earth, and "anything good." It is then ploughed down, scarified with a cultivator, and left to rest. Sometimes artificial manure is given, and a small quantity of guano is imported. On the waste lands an immense quantity of ferns grow, which, being cut, make excellent beds for the cattle, and when they have served this purpose they form a capital manure. May and June are the great months for sending potatoes to market, though, owing to the mildness of the Winter, potatoes planted in December are often drawn again in March, when there is a good sale for them. After potatoes, he gets a fine crop of mangel.

Seakale is largely grown on the Islands, and sent to the London, Birmingham, and Manchester markets. It is grown in the open air,

¹ The surveys of 1851 and 1861 may be considered incorrect; every little barren rock must have been taken into calculation to have given 4,080 acres. That of 1883 seems the correct one. The sea, though ever making encroachments, would not have taken into itself 520 acres in so short a period.

and blanched in the same way as celery, with the exception that it is planted on the surface instead of in the trenches. Seakale would be by far the most remunerative crop, and if only they could ensure 3*d.* or 4*d.* a pound for it, the Scillonians would go into its cultivation very largely. It requires no manure, but wants a light soil. At Tresco a great quantity is grown : the cost per acre is 30*l.* or 40*l.*, the return, 70*l.* or 80*l.*

The island of *Tresco*, though only twenty minutes' distance by boat (in fine weather), is much warmer than St. Mary's, because of the sand all round it. Mr. Dorrien Smith's farm at Tresco is essentially a model farm. He spares neither expense nor trouble, and when a successful result is attained, he shares it with his tenants. He uses about 30 tons of seed-potatoes for planting. Twenty-five to thirty acres are planted with potatoes ; where possible, they are planted on slopes, so as to escape the wind, and the order of planting is "six rows, one miss." The "miss" is well manured, and later on is turned up and spread over the six rows. Three tons of seakale and 5 tons of tomatoes were sent from here last year. From 17 to 20 acres are devoted to flowers. Mr. Smith is experimenting upon a parcel of land, dividing it into four—dressing one part with fish-manure, one with farmyard manure, the third with seaweed, and leaving the fourth unmanured. He has 20 Channel Islands cattle, and about 100 pigs. The food for the last is cut up, and cooked in a large boiler. The dried fern makes good litter for pigs and cattle.

All sorts of fences are tried on this farm, for the protection of flowers and vegetables. The rush fences are too opaque ; the shrubs require great attention, and occupy valuable space ; but the open palings of wood protect, while they permit the sun to play through.

Of all the Islands, *St. Martin's* produces the most potatoes, while some of the earliest come from *Bryher*.

On the whole Islands there are between 400 and 500 bullocks, 250 sheep, 100 milch cows, and 70 asses. There is no veterinary surgeon on the Islands, but one of the farmers is exceedingly clever in the treatment of animals, and all the farmers are more or less expert in this respect.

E. BREWER.

THE HARVEST OF 1889 AT HOME AND ABROAD.

SPEAKING generally, it may be said that the harvest of 1889 was a good one in the West of Europe, and a poor one in the Centre and East ; that it was productive in the United States and deficient in Canada and India, at least, for wheat and one or two other crops ; and that for the world, as a whole, it was distinctly below the normal standard of productiveness. In some countries, such as Australia and the Argentine Republic, where the harvest is begun in December and finished in January, the crops of 1889-90 must be

classed with those of 1889, as they come for consumption mainly during the current cereal year, and in these countries the crops have turned out well, though not nearly equal to early expectations in Australia at any rate. Tasmania and New Zealand are usually classed with the rest of Australia, though their harvests are well into the new year; but of the crops of these colonies nothing more than approximate estimates can at present be offered, and they are based upon low expectations in the former colony and moderate ones in the latter. In the case of India, where the greater portion of the wheat crop is secured in March, the produce of 1890 cannot fitly be put with the crops of countries which gather in their harvests in 1889, although such information about it as is at present available will be noticed in the proper place. With these few explanatory remarks, I must at once proceed to give results, as far as they can be given, on the authority of official and other reputable estimates, the space at my disposal being insufficient to allow of a recital of the causes of abundance or deficiency in the several countries.

THE UNITED KINGDOM.—Although in many parts of the country the results of last harvest have proved extremely disappointing, particularly in relation to the cereal crops, the Agricultural Produce Statistics show that, taking all crops into consideration, the past year was one of the most productive of the “eighties.” In the Table on pages 244 and 245 will be found details as to the acreage and produce of the several crops in 1888 and 1889. In the subjoined summary table the broad results for the United Kingdom are shown, while the yield per acre is also compared with the “ordinary average” :—

Crop	Area		Produce		Yield per acre		
	1888	1889	1888	1889	1888	1889	Ordinary average
	acres	acres	bushels	bushels	bushels	bushels	bushels
Wheat	2,063,250	2,539,099	74,493,133	75,883,611	27·97	20·69	28·71
Barley	2,256,870	2,307,784	74,545,540	74,763,755	33·03	32·37	33·95
Oats	4,163,119	4,127,656	157,975,075	164,073,736	37·95	39·75	38·78
Beans	344,147	324,780	9,844,474	9,374,942	28·61	28·87	30·35
Peas	242,340	225,432	5,862,089	5,921,107	24·20	26·27	28·46
			tons	tons	tons	tons	tons
Potatoes	1,594,726	1,306,456	5,532,331	6,435,337	4·00	4·71	4·55
Turnips	2,238,415	2,218,554	28,001,632	32,007,095	12·51	14·43	14·89
Mangolds	406,934	370,149	6,829,322	6,740,278	16·78	18·21	19·01
Hay (all kinds)	9,201,433	9,651,742	15,132,555	16,284,879	1·63	1·69	1·80
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
Hops (England only)	53,490	57,724	281,291	497,811	4·81	8·62	7·84

It is desirable to mention that the areas of crops in the Produce Statistics do not correspond with those of the Agricultural Returns, because in the former the figures for the Isle of Man and the Channel Islands are not included. I must also explain that the ordinary average yield for the United Kingdom, not given in the Agricultural Produce Statistics, is a true average worked out from that of Great Britain, as officially stated, and the ten years' average of the Irish official statistics.

In dealing with the crops of foreign countries, I give official statistics for nearly all the principal producing countries and the

latest available, having written to the Agricultural Department of every country in Europe which has one. For some countries there are no estimates for any crop but wheat; but the figures for the other principal grain crops are given as far as there are any trustworthy estimates. It is necessary to point out, however, that even official estimates of the crops of 1889, available at the present time, are subject to revision in some cases; also that the apparent precision of some of the estimates arises from the conversion of foreign into English measures, round numbers being in some cases made more precise by that process.

RUSSIA.—A revised statement of the produce of the wheat and rye crops of Russia-in-Europe, exclusive of Poland, was issued by the Russian Department of Agriculture at the end of February. Converted into bushels, with the corresponding figures for the two previous years added, the quantities are as in the following table:—

	1887	1888	1889
Wheat . . .	268,992,000 bushels	235,976,000 bushels	178,277,600 bushels
Rye . . .	721,246,538 "	663,600,000 "	535,704,000 "

The crops of 1889 are made much smaller in this revised estimate than in the first one issued by the Department.¹ For Poland the estimates are 10,128,000 bushels of wheat, and 44,000,000 bushels of rye, making the totals for European Russia, including Poland, 188,405,600 bushels of wheat and 579,704,000 bushels of rye. The official estimate of the wheat crop of 1888 is equal to 14,268,000 bushels of 60 lb. The oat crop appears to have fallen very little short of that of last year, which was 512,400,000 bushels for Russia, exclusive of Poland, while the barley crop is about 120,000,000 bushels, as compared with 148,400,000 bushels for 1888, and 157,920,000 bushels for 1887. The Russian harvest was as deficient in 1889 as it was excessive in the two previous years.

ROUMANIA.—Mr. Percy Sanderson, British Consul at Galatz, has favoured me with an estimate of the crops of 1888, obtained from the Roumanian Department of Agriculture through Her Majesty's *Chargé d'Affaires* at Bucharest, but informs me that the estimates for 1889 are not completed. As the notions of the produce of the principal crops in Roumania are very vague, it is well worth while to give the official figures in English measure:—

Wheat	3,103,080 acres	54,730,120 bushels
Rye	743,211 "	14,172,414 "
Barley	1,251,018 "	22,346,035 "
Oats	528,407 "	9,960,739 "
Maize	4,194,008 "	59,095,737 "

The wheat crop of 1889 has been estimated by the Minister of Finance at 43,400,000 bushels.

¹ Estimates, which have been obligingly sent to me by the Département since this article was in type, give details for European Russia, exclusive of Finland and the Caucasus as well as Poland. Allowing for certain omissions they appear to confirm the estimates given above.—W. E. B.

AUSTRIA-HUNGARY.—A preliminary official report on the principal cereal crops of Austria, exclusive of Hungary, recently issued, puts the quantities as below compared with those of 1888:—

	1888	1889
Wheat	36,993,000 bushels	29,961,250 bushels
Barley	46,733,500 "	37,908,750 "
Oats	84,931,000 "	67,562,000 "
Rye	64,718,500 "	58,115,750 "

No official report of the acreage appears to have been issued at present. In 1888 the areas were 2,964,360 acres of wheat, 2,828,600 of barley, 4,685,180 of oats, and 5,033,400 of rye.

No recent official report on the harvest in Hungary has been issued, but one from Consul Faber, published in September by the Board of Agriculture, gives the following figures for 1889:—

Wheat	7,540,000 acres	95,000,000 bushels
Rye	3,290,000 "	46,000,000 "
Barley	2,594,000 "	38,000,000 "
Oats	2,639,000 "	37,000,000 "

The acreage is much greater than that given for 1888 in our Agricultural Returns, and I fancy that it must have been miscalculated; but the produce tallies sufficiently in the two accounts, considering that the crops in Hungary in 1889 were very much below average. According to the Agricultural Returns the areas and produce of the principal cereals in 1888 were as follows: Wheat, 6,841,999 acres and 131,670,278 bushels; rye, 2,731,203 acres and 40,894,216 bushels; barley, 2,423,996 acres and 43,721,436 bushels; and oats, 2,581,451 acres and 54,771,651 bushels. It will be seen, then, that, according to Consul Faber's figures, there was a great reduction in the produce of every crop but rye in 1889.

GERMANY.—In this country the crops were deficient in a marked degree in 1889. The wheat crop, grown on 4,775,342 acres in 1888, and producing 92,024,000 bushels, is estimated to have produced only about 84,000,000 bushels last year. The areas and produce of the other principal cereals in 1888 were as follows: Rye, 14,361,205 acres and 202,868,650 bushels; barley, 4,256,094 acres and 99,646,800 bushels; oats, 9,466,245 acres and 266,060,000 bushels. The produce in 1889 was much smaller in each case.

ITALY.—The latest official statements of acreage are the following, being average areas for the period 1879–83: Wheat, 10,951,340 acres; maize, 4,675,999 acres; oats, 1,099,051 acres; barley, 856,552 acres; rye, 396,894 acres; beans and peas, 1,779,929 acres. The produce in 1887 and 1888 and the preliminary estimate of that of the most important crops in 1889 will be found below:—

	1887	1888	1889
Wheat	115,633,158 bushels	101,032,822 bushels	100,630,475 bushels
Maize	72,432,845 "	62,863,243 "	72,834,025 "
Oats	16,157,034 "	13,722,101 "	14,128,425 "
Barley	7,720,575 "	6,566,736 "	— "
Rye	4,204,904 "	3,536,316 "	— "
Pulse	12,157,414 "	11,259,358 "	— "

The harvest, it will be seen, was a tolerably good one for maize and a poor one, like that of 1888, for wheat and oats.

SWEDEN.—To an official report on the crops for 1888 and 1889, for which I am indebted to the Central Statistical Bureau of Sweden, I have added the ten years' averages of production as below :—

	1888	1889	Ten years' average
Wheat	3,698,475 bushels	3,593,650 bushels	3,566,738 bushels
Rye	19,389,925 "	20,279,325 "	20,426,311 "
Barley	13,102,925 "	13,665,300 "	15,471,469 "
Oats	60,863,275 "	48,056,800 "	55,826,961 "
Mixed grain	7,937,875 "	6,556,550 "	6,810,284 "
Peas	1,227,875 "	1,449,800 "	1,677,530 "
Beans	260,700 "	156,200 "	268,995 "
Vetches	518,100 "	656,975 "	758,748 "
Potatoes	41,278,325 "	68,554,200 "	51,577,554 "

From these figures it appears that the wheat, oat, mixed grain, and bean crops of 1889 were inferior to those of 1888, the other crops being superior. Compared with the ten years' average, all the crops of last harvest except wheat and potatoes fell short; but, without knowing the areas, it cannot be told whether the yield per acre was above or below average. No statistics of area have been collected since 1887, when wheat covered 1,088,868 acres, other white-straw crops, 2,742,611 acres; peas and beans, 141,560 acres; and potatoes, 384,401 acres.

HOLLAND.—Unfortunately the official agricultural statistics of Holland for 1888 and 1889 give only estimates of the condition of the crops in relation to an average yield. The figures indicate crops of wheat, rye, barley, and oats in 1889 much superior to those of 1888, but not equal (excepting barley) to those of 1887. They are almost exactly the same as the figures for 1885, for which year the acreage and produce are given in our Agricultural Returns as follows :—

Wheat	209,364 acres	6,138,544 bushels
Rye	503,574 "	11,216,485 "
Barley	122,512 "	5,805,743 "
Oats	282,951 "	12,635,697 "

As the area of the wheat crop varies but little in Holland, it is probable that the produce was about 6,000,000 bushels in 1889, and this estimate is close to one recently given by a French authority.

BELGIUM.—A fairly good harvest was reaped in Belgium last year. The acreage appears to be published officially only at intervals, and the latest details given in our Agricultural Returns show 681,552 acres of wheat, 616,230 acres of oats, 90,250 acres of barley, and 685,771 acres of rye. No official estimate of the crops of 1889 appears to have been issued at present; but *Beerbohm's List* puts the wheat crop at 19,000,000 bushels, as compared with 15,000,000 produced in 1888.

DENMARK.—There are no returns of acreage in Denmark later than those of 1881, when there were 137,818 acres of wheat, 660,065 of rye, 781,408 of barley, and 991,394 of oats. The pro-

duce in 1888 was 3,662,808 bushels of wheat, 15,098,125 of rye, 22,608,012 of barley, and 32,400,772 of oats. In 1889 the wheat crop was estimated at an average, which is about 5,000,000 bushels, the acreage having probably increased since 1881. The rye crop was over average, and may be put at about 16,500,000 bushels. Barley was much under average, and oats worse still. An average crop of barley is about 22,000,000 bushels, and an average crop of oats is about 30,000,000 bushels.

FRANCE.—An excellent harvest was gathered last year in France. Complete statistics have not yet been published, except with respect to wheat and rye, and these are subject to revision. The following are the English equivalents of the areas and quantities sent to me by the Ministry of Agriculture :—

	1888		1889
Wheat	17,235,990 acres	271,537,000 bush.	17,613,813 acres 306,515,682 bush.
Rye	4,023,240 "	61,016,510 "	4,085,512 " 71,221,883 "

Statistics of other crops are always very slow to appear in France, those for 1888 having only recently been published. They put the area of barley at 2,207,440 acres and the produce at 43,453,124 bushels, the corresponding figures for oats being 9,223,664 acres and 233,633,880 bushels. The produce of both crops in 1889 was greater than these quantities.

SPAIN.—An official report compares the yield of the principal crops of Spain in 1889 with average crops as follows :—

	1889	Average
Wheat	73,520,000 bushels	90,136,000 bushels
Barley	41,712,000 "	45,976,000 "
Rye	24,224,000 "	20,336,000 "
Maize	17,968,000 "	21,424,000 "

The comparison shows that the last harvest in Spain was generally deficient, though in the autumn it was reported to be a good one.

SWITZERLAND.—No official agricultural statistics are collected for Switzerland as a whole, though crop estimates are issued in certain districts. In *Beerbohm's List* the wheat crop of 1889 is put at 2,400,000 bushels, as compared with 2,048,000 in 1888 ; while lower estimates were given some time back in *Dornbusch's List*. The harvest was reported to be a good one.

TURKEY AND BULGARIA.—With respect to Turkey-in-Europe I take Mr. Beerbohm's estimate of 32,000,000 bushels as the wheat crop of 1889, as compared with 40,000,000 for 1888. The Bulgarian Minister of Finance has recently estimated the crop of Bulgaria at 35,200,000 bushels. These are higher estimates than I have previously seen, but they are taken as better authorised than any others. As the crops were smaller than in 1888, the produce of that year must be assumed to be greater than it has been put before.

THE UNITED STATES.—The American harvest was a good one for nearly all crops. The following table, compiled from the returns of the United States Department of Agriculture, shows the area, produce, and yield per acre of the principal crops in 1889, as compared with the average yield for the twenty years ending with 1888 :—

Crop	Area in acres	Produce in bushels	Yield per acre (bushels)	Average for 20 years (bushels)
Wheat . . .	38,123,859	490,560,000	12·9	12·2
Maize . . .	78,319,651	2,112,892,000	27·0	25·4
Oats . . .	27,462,316	751,515,000	27·4	28·1

Barley is reckoned quite one of the minor crops in the United States, only about three million acres of it being grown, and the estimated produce for 1889 is not yet made known. The latest report states that "the minor cereals make about their usual product." The potato crop was very abundant in the West, and deficient in the East.

CANADA.—It is only from Ontario and Manitoba that agricultural statistics are issued annually. But it is in those provinces that nearly all the wheat produced in Canada is grown, the great province of Quebec, for instance, having less than a quarter of a million acres under that cereal, and producing only about two million bushels annually.

The final returns of *Ontario* for the principal crops, those of 1889 being compared with the averages for 1882-9, are as below :—

Crops in Ontario	Area		Produce		Yield per acre	
	1889	1882-9	1889	1882-9	1889	1882-9
	Acres	Acres	Bushels	Bushels	Bushels	Bushels
Winterwheat	822,115	332,300	13,001,865	18,056,559	15·8	19·4
Spring "	398,610	565,385	5,697,707	8,804,317	14·3	15·6
Barley . .	875,286	772,245	23,386,388	20,218,930	26·7	26·2
Oats . . .	1,923,444	1,613,631	64,346,301	57,041,035	33·5	35·3
Peas . . .	708,068	644,498	13,509,237	13,171,725	19·1	20·4
			Tons	Tons	Ton	Ton
Hay . . .	2,886,223	2,236,622	3,728,313	3,041,077	1·56	1·36

Wheat, oats, and peas, it will be seen, were below the average in 1889, barley and hay being above the average. The average of wheat has been decreasing for several years, while the cultivation of other crops has been extended.

In the case of *Manitoba* the acreage and yield in 1889 are compared with the averages for the five years ending with 1887, as shown in the following table :—

Crops in Manitoba	Area		Produce		Yield per acre	
	1889	1883-7	1889	1883-7	1889	1883-7
	Acres	Acres	Bushels	Bushels	Bushels	Bushels
Wheat . . .	623,245	339,950	7,201,519	7,137,210	12·4	20·6
Barley . . .	80,238	53,383	1,051,551	1,308,437	13·6	25·8
Oats . . .	218,744	155,716	3,415,104	5,302,963	16·8	33·7
		Tons	Tons	Tons	Ton	Ton
Hay . . .	—	199,501	—	278,843	1·04	1·53

These figures show that the harvest was a bad one in Manitoba last year, whilst in 1888 no returns were collected. The average yields, therefore, as given above, are probably higher than they would have been if the calculation had not stopped short at 1887.

Oats are grown extensively in Quebec, and barley is a good deal cultivated in Nova Scotia, as are potatoes also; but no official returns have been issued, I believe, since the census year, 1881, when nearly twenty million bushels of oats were grown in the former province.

AUSTRALASIA.—Great disappointment of early expectation has taken place in Australia since harvest began, rust and storms of rain having caused an enormous amount of damage to the cereal crops. In South Australia crops of wheat which were at one time estimated at 20 to 30 bushels an acre have yielded only 5 to 7 bushels of shrivelled grain. It is supposed that the average yield has been diminished by rust to the extent of 4 bushels an acre, and it is much the same in Victoria. In the two colonies the loss from this cause is estimated at 2,000,000*l*. The area of the wheat crop in *South Australia* is put at 2,004,000 acres, and the yield is estimated by the *South Australian Register* at $9\frac{1}{2}$ bushels an acre, making a total of 19,130,000 bushels. This, though much less than was at one time expected, is a great advance upon the miserable crop of 1888–9, which was estimated at only 6,187,000 bushels.

In *Victoria*, the only other wheat-exporting colony of Australia, the area of the new crop is estimated by the *Australasian*, after careful inquiries, at 1,200,000 acres, against 1,248,000 acres in 1888–9, the cause of the decline being the cutting for hay of a large acreage on account of rust. The produce is put at 11,912,500 bushels, or 9.9 bushels an acre, as compared with 9,529,000 bushels, or 7.6 bushels an acre, in 1888–9. Thus the two principal wheat-growing colonies of Australia have probably produced about 31,000,000 bushels.

In *New South Wales* the area of wheat is less than 400,000 acres, and in *Western Australia* it is less still, while in *Tasmania* it is only about twice as much, and in *Queensland* it is quite insignificant; therefore the production in these colonies does not count for much, except as it affects the wheat surplus of Australasia as a whole.

In *New Zealand* the crops were seriously injured by storms just before harvest. Last season the official estimate was 8,770,246 bushels from 362,153 acres, and this year from an enlarged area about the same quantity may be expected.

ARGENTINE REPUBLIC.—There are no satisfactory agricultural statistics for this country, and estimates for the same year are never twice alike. According to the best authorities, from five to six million acres are under crops, chiefly wheat, maize, lucerne, linseed, fruit, sugar-cane, and tobacco. The wheat area is about two million acres. The annual consumption of wheat in the country is about 18,000,000 bushels, and as wheat was imported from Russia in 1889, the crop of 1888–9 could not well have been more than

that quantity, allowing for seed. The harvest recently gathered in is one of the best ever grown, but probably barely equal to the splendid one of 1886-7, when there was a surplus for export of about 8,000,000 bushels. Moreover, the area sown for the last crop was reported to be smaller than that of 1888-9. In spite of some very sanguine estimates of the new crop, it can scarcely exceed that of 1887, and may be put at about 24,500,000 bushels. Maize appears to be grown on about a million acres, and the new crop is a very good one—probably 20,000,000 bushels.

CHILE.—No satisfactory statistics for this country are available. The wheat crop recently harvested is reported to be a very abundant one, and it is estimated at about 16,000,000 bushels, as compared with about 12,000,000 bushels produced in the previous year.

EGYPT.—The wheat crop of Egypt in 1889 was estimated at about 6,000,000 bushels, as compared with 8,000,000 bushels in 1888. The produce of 1890 is quite uncertain.

INDIA.—The final estimate of the wheat crop of British India for 1889, as issued by the Revenue and Agricultural Department, is 237,147,856 bushels, as compared with 260,372,800 bushels for 1888. The crop of 1890 is expected to turn out much less than that of either of the two previous years. The following table shows the acreage and estimated yield in 1889, as compared with the figures for 1888 and with the averages for the four years 1885-9 :—

	1888	1889	Four years' average
Area, acres	26,854,682	26,381,765	26,508,000
Produce, bushels	260,372,800	237,147,856	262,404,224

It will be seen from these figures that the area and production of wheat in India have declined in recent years. Last year's area was more than a million acres less than that of 1886.

OTHER COUNTRIES.—It is impossible to obtain satisfactory statistics for some countries, including our own colonies in South Africa, of the produce of which colonial representatives in this country are not able to give information. South Africa is a grain-importing country, or set of countries, and it is therefore of less consequence than it otherwise would have been that no estimates of the wheat crop of the whole of that part of the world can be given. In the following account of the wheat crop of the principal countries of the world, however, I have taken the best available estimates for such countries as Asia Minor, Egypt, Persia, and Syria.

THE WHEAT CROP OF THE PRINCIPAL COUNTRIES OF THE WORLD.

"The Wheat Crop of the World" is a heading sometimes used by writers on the corn trade; but it is a misleading one, as no one has ever even pretended to give a complete list of the produce of every country in which more or less wheat is grown. There are several countries in Asia, Africa, and South America in which the quantity is not even approximately known, and when quantities for China or Japan, for instance, are given, they can only be regarded

as pure guesses. In the following list the quantities for all the principal producing countries are official, while for certain small or remote countries I am indebted to the estimates of such authorities as *Beerbohm's List* and the *Echo Agricole*. For convenience of reference the list is made alphabetical.

Countries in Europe	1888	1889	Countries in Europe	1888	1889
	Bushels	Bushels		Bushels	Bushels
Austria . . .	36,998,000	29,961,250	Brought forward	697,855,788	686,019,582
Hungary . . .	131,670,278	95,000,000	Portugal . . .	6,860,000	9,000,000
Belgium . . .	15,000,000	19,000,000	Roumania . . .	54,720,130	43,400,000
Bulgaria . . .	86,000,000	85,200,000	Russia (including Poland) . . .	300,244,000	188,405,600
Denmark . . .	3,662,808	5,000,000	Servia	4,390,800	8,850,000
France	271,537,000	306,515,632	Spain	65,760,000	73,520,000
Germany . . .	92,024,000	84,000,000	Sweden	8,698,475	8,593,650
Greece	4,828,750	4,400,000	Switzerland . .	2,048,000	2,400,000
Holland	4,800,000	6,000,000	Turkey	40,000,000	32,000,000
Italy	101,062,822	100,680,475	United Kingdom	74,493,133	75,883,611
Norway	812,125	812,125			
Carried forward	697,855,788	686,019,582	Europe	1,250,070,321	1,118,072,393

Countries outside Europe	1888	1889	Countries outside Europe	1888	1889
	Bushels	Bushels		Bushels	Bushels
Algeria	19,208,000	20,592,000	Brought forward	182,457,977	152,113,091
Argentina Republic ¹ . . .	18,000,000	24,500,000	Cape Colony, &c.	3,819,688	4,500,000
Australasia ¹ . . .	26,205,977	42,000,000	Chile	12,000,000	16,000,000
Asia Minor . . .	37,044,000	37,120,000	Egypt	8,000,000	6,000,000
Canada (Ontario and Manitoba only) . . .	82,000,000	25,901,091	India	260,372,800	237,147,856
			Persia	21,952,000	22,000,000
			Syria	14,187,500	12,400,000
			United States . .	415,868,000	490,560,000
Carried forward	182,457,977	152,113,091	Totals for these countries	868,657,963	940,720,947

Adding the totals for Europe to those of countries outside that continent, the grand totals for the principal countries of the world are 2,118,728,284 bushels for 1888 and 2,058,793,340 bushels for 1889, showing a decrease for 1889 of 59,934,944 bushels.

WILLIAM E. BEAR.

DAY ON HORSE-BREEDING.²

"HERE is a man writing on a subject which he understands," was the first thought that struck me when I saw the title. The author in his preface says he attributes the kind reception of his former volumes to the fact that he "had something to say of a practical kind, such

¹ Years 1888-9 and 1889-90.

² *The Horse: How to Breed and Rear Him*. By William Day. Second Edition, pp. 453. (London: Richard Bentley and Son, 1890.)

as only a breeder and trainer of many years' experience could say." Exactly : but with this expectation I must admit a little feeling of disappointment and impatience to find page after page devoted to the study of the natural history and early records of the horse, and this couched in somewhat too scientific language. It is a little surprising also, inasmuch as the author condemns Captain Upton's book, *Newmarket and Arabia*, for this very reason, and says: "It is, I have no doubt, a work of much labour and erudition, though of little importance except to those who care to trace the horse of the present day back to the earliest times on record." How much further than Mr. Day Captain Upton has gone back I cannot say, for our author carries us back to "Persia and Armenia, in which countries the horse would first be propagated after its liberation from the ark."

Much space is devoted to pointing out the effect of the Arab crosses in early days upon our thoroughbred stock, and Mr. Day sums up by saying, "The cross with the Arabian was an extremely fortunate one, as apparently just giving certain qualities which our own horses lacked at that distant period. But for all practical or useful purposes in this country, the Arab horse might to-day be as defunct as the Dodo or the huge Mastodon of North America." He considers the Arab as utterly useless as a cross upon our thoroughbred stock, and hopes the "growing disposition to reintroduce it" may be "nipped in the bud."

Twenty-nine pages are devoted to proving that abortion, sterility, temper, defective sight, roaring, and splints, are hereditary diseases. That abortion is infectious, from sympathy or some cause, I believe, but have not experienced it to be hereditary either in horses or cattle. That temper, impaired sight, roaring, and splints are hereditary most people admit. It is pleasant to hear so great an authority say that there are not so many roarers now as formerly, and this he attributes to the greater care now taken of horses. At the same time we cannot forget that "Stonehenge" stated, "Without doubt roaring is far more common than it used to be, and the possession of enlarged joints and back sinews is the rule instead of the exception."

Fifty pages are devoted to the selection of mares and stallions, and on the general principles of selection the author says "the most important point is to select so as to ensure soundness of limbs and health of constitution . . . I should choose a mare standing 15 hands and 1 or 2 inches in height, having a small head and a short neck, with good shoulders, back and hind quarters, with broad hips and deep fore ribs, with satisfactory hocks, knees and feet, and standing well upon her legs."

In speaking of the uncertainty of breeding he observes: "It is noticeable that the stock got by some of the most successful stallions out of a variety of mares differs in shape, size, and breeding." With this remark all who have any experience of the subject will agree, and he might almost have gone further, and said out of the same mare. Mr. Day suggests that more races ought to be instituted for geldings, and would prefer this plan of using the Queen's Plate

money to that of giving Prizes at agricultural shows ; at all events he would divide it.

The chapter on "Mating" is full of really practical hints of great value to the breeder, as also is that upon the treatment of the mare, the foal, the yearling, and the stallion. Of the "Hunter and Troop Horse" he says : "All good hunters are now more or less derived from a thoroughbred cross." "When mating with the intent to get hunters, the following are the chief points to study. Both the horse and mare should have good action, and should be temperate and well-mannered. They should have good heads and necks, with fine long slanting shoulders rising at the withers. They should each have a strong broad back and ragged hips, with good propelling power to assist them over their fences. They should have strong bone, and stand well on their legs, having flat hocks well bent under them, free from curb or any defect. They must also be sound and have no taint of disease, hereditary or otherwise. All these points, too, ought to characterise with equal fulness the relatives of both the horse and the mare we select. As to size, I should prefer a mare about 15 hands and 1 or 2 inches, not more, and a stallion of about 15½ hands high."

We now come to what is evidently a pet subject of our author's, and find him devoting fifty pages to prove the economy to farmers in using half-bred horses instead of cart-horses or Shires. His chief argument is that whereas a cart-horse walks only 1½ miles an hour, a half-bred walks 2½. By applying this to ploughing he makes a calculation to prove that on a farm where twenty-four horses are kept, the saving under this head would be 725*l.* 8*s.* per annum, which, added to the net profit to be derived from the yearly produce of twenty-four well-bred mares, makes a total profit of 1,347*l.* 16*s.*, and he adds : "This certainly seems an immense sum for any farmer to add to his revenue by adopting the system I advocate, yet I shall show that the estimate is still capable of augmentation." Applying this principle to the whole tillage land of Great Britain, he states : "The national gain then would amount to 22,657,494*l.* ;" and remarks : "Surely so immense a present loss and possible gain is worth reflection, and cannot long remain neglected."

Mr. Day values the produce of the half-bred mares at four years old at 70*l.* to 80*l.* each. Some people may say this is too high, and that Shires come to be useful at 2 years old, and are more easily sold. The question of light horses *versus* heavy for farm work has been often discussed, but it is too big to go into here. For grass-mowing, carriage horses are admirable, but for ploughing much depends on the quality of the ground. On heavy clay-land you must have big horses ; the weight is necessary to get steady ploughing. Again, locality, as to whether it offers a more ready sale for heavy or light horses, is to be considered.

Twenty-eight pages suffice to deal with the Draught Horse, the Trotter, the Galloway, the Pony, and the Ass. Of the latter Mr. Day speaks in much praise and says : "If landlords could be induced to keep a good Jackass for the use and benefit of their poor tenants and others, whether labourers, costermongers, itinerant dealers, or what not, some good might surely accrue."

The chapter on the class of land for a stud farm and its management will be read with the greatest interest and respect as the result of long personal experience. "The soil should be light and dry, preferably of light friable loam. It should be kept in good heart. Such wet districts as there are in many parts of Lancashire certainly do not appear well suited for the raising of thoroughbreds. But there are exceptions to every rule, and even here, a 'Mendicant' was bred. Much better localities are those found in Yorkshire, or on the chalk and limestone of the south."

The last two chapters are devoted to exposing some "Errors and Fallacies," and in giving some final suggestions. "Stonehenge" is put right on a point in training. This is the only technical allusion to this important profession that I have come across, so the author cannot be accused by his brother trainers of disclosing the secrets of the craft. Mr. Day concludes with a truism all will admit: "If a third of our mares and a like number of our stallions were excluded from the pages of *The Stud Book* and no longer looked upon as thoroughbreds, we should probably have better horses and more of them than we have now." ALFRED ASHWORTH.

THE SHOW OF THOROUGHBRED STALLIONS.

THE Annual (Spring) London Horse Show, held jointly by the Royal Commission on Horse Breeding, the Royal Agricultural Society of England, the Hunters' Improvement Society, and the Hackney Horse Society, took place at the Royal Agricultural Hall, Islington, on March 4, 5, 6, and 7, 1890. The following particulars relate solely to Thoroughbred Stallions, which were shown under the auspices of the Royal Agricultural Society and the Royal Commission, and of which there were 98 entries, 5 additional entries appearing as "extra stock" not competing for premiums. The first Spring Show of Thoroughbred Stallions was held by the Royal Agricultural Society for the northern district at Newcastle-upon-Tyne, in January 1887, on which occasion there were 45 horses in the catalogue. The first joint Show of the Royal Commission and the Society for the whole of England was held early in February 1888 at Nottingham. In 1889, as again this year, the joint Show was held at Islington. The subjoined table shows the total entries in the years named, the geographical limits of the districts being detailed below in connection with the awards:—

District Class	Nottingham, 1888	Islington		District Class	Nottingham, 1888	Islington	
		1889	1890			1889	1890
A	14	21	14	H	2	3	5
B	11	6	8	I	4	3	1
C	24	7	17	J	3	3	4
D	10	13	17	K	3	2	2
E	16	11	8				
F	11	10	14	Total	105	90	98
G	7	11	8				

The Royal Commissioners on Horse Breeding offered twenty-two "Queen's Premiums" of 200*l.* each for Thoroughbred Stallions (three years old and upwards), on condition that each stallion winning a premium should serve not less than fifty half-bred mares, if required, during the season of 1890, and should stand or travel at the owner's option in the district for which he is exhibited, at a fee not exceeding forty shillings for each mare, and two shillings and sixpence to the groom.

These Premiums were intended to subsidise *six-sevenths* of England and Wales, in accordance with the district map of the Royal Agricultural Society of England, the remaining district being undertaken this year by the Royal Agricultural Society, who offered three Premiums of 200*l.* each, with a special Gold Medal.

The Judges of the Thoroughbred Stallions were the Earl of Coventry, Croome Court, Severn Stoke, Worcestershire (acting in the place of Viscount Combermere, who was unable to officiate); Mr. William Baird, Barleythorpe Hall, Oakham; and Mr. W. Dunne, Ballymanus, Stradbally, Queen's County. The veterinary inspectors were Mr. Alexander C. Cope, Board of Agriculture, 44 Parliament Street, S.W.; Mr. T. D. Lambert, Store Street, Dublin; and Mr. John Lawson, Great Bridgewater Street, Manchester.

The following are the Judges' awards:—

DISTRICT CLASS A (Bedfordshire, Buckinghamshire, Cambridge-shire, Essex, Hertfordshire, Huntingdonshire, Middlesex, Norfolk, Oxfordshire, and Suffolk).—14 entries. Three Queen's Premiums: No. 9, Mr. Walter Gilbey's *Pearl-Diver*; No. 12, Mr. Leopold de Rothschild's *Roswal*; No. 14, Mr. Burdett-Coutts's *Truefit*. Reserve: 1st, No. 7, Mr. T. Jennings's *Montague*.

DISTRICT CLASS B (Cumberland, Durham, Northumberland, Westmoreland).—8 entries. Three Queen's Premiums: No. 17, Mr. Nathaniel Clark's *Even*; No. 18, the Earl of Durham's *Glendale*; No. 19, Mr. E. H. Banks's *Moss Hawk*. Reserve: 1st, No. 15, Mr. W. Steel's *Blue Grass*; 2nd, No. 22, Mr. M. Young's *Uxbridge*; 3rd, No. 20, Sir H. B. Meux's *Pull Together*.

DISTRICT CLASS C (Derbyshire, Leicestershire, Lincolnshire, Northamptonshire, Nottinghamshire, and Rutlandshire).—17 entries. Three Queen's Premiums: No. 23, The Earl of Lonsdale's *Blue Blood*; No. 25, Mr. J. E. Platt's *Connaught*; No. 36, Mr. Haslewood's *Suleiman*. Reserve: 1st, No. 35, Mr. J. W. Simpson's *Roll Call*; 2nd, No. 37, Mr. H. Martin's *The Jolly Friar*; 3rd, No. 31, Mr. A. J. Brown's *Macaulay*.

DISTRICT CLASS D (Berkshire, Cornwall, Devonshire, Dorsetshire, Hampshire, Kent, Somersetshire, Surrey, Sussex, and Wiltshire).—17 entries. Three Premiums of 200*l.* each, and Gold Medal, given by the Royal Agricultural Society: No. 43, Mr. G. P. Finch's *Eclipse*; No. 47, Mr. Isaac Clark's *Jack Tar*; No. 48, Mr. Alex. Taylor's *Lancastrian*. Reserve: 1st, No. 50, the Compton Stud Company's *Masque-de-Fer*; 2nd, No. 42, Lieutenant-General O. L. Cope-Williams's *Bruar*; 3rd, No. 56, Mr. G. Jeffery's *Young Glen Arthur*.

As these are the Stallions in which the Society is this year more particularly interested, details as to their breeding are subjoined :—

ECLIPSE, chestnut, foaled 1883. *Sire*, Ethus, or Van Amburgh ; *dam*, Tormentor by King Tom ; *g.d.*, Torment by Alarm. Exhibitor, Mr. G. P. Finch, The Briars, Alphington, Exeter ; breeder, Mr. Benjamin Ellam, Piccadilly.

JACK TAR, brown, foaled 1881. *Sire*, Jolly Tar ; *dam*, Water Lily by Mariner ; *g.d.*, Lily by Cape Flyaway. Exhibitor and breeder, Mr. Isaac Clark, The Manor, Heddington, Calne, Wilts.

LANCASTRIAN, brown, foaled 1876. *Sire*, Toxophilite ; *dam*, Lady Sefton by West Australian ; *g.d.*, Clarissa by Pantaloon. Exhibitor, Mr. Alexander Taylor, Manton House, Marlborough ; breeder, the Glasgow Stud.

The Hunter Stallion Committee of the Society has decided that these Stallions shall be stationed during the present season as follows :—*Eclipse* in the Exeter District at his owner's stables, The Briars, Alphington, Exeter ; *Jack Tar* in the Plymouth District ; and *Lancastrian* in the Windsor District, at the South Lea Farm, Datchet. Their period of service will extend from March 20 to June 20, after which they will be exhibited (but not for competition) at the Society's showyard at Plymouth, from June 23 to 27. The District Committees, to whom will be referred all questions relating to these Stallions during their season of service, have been constituted as follows :—

Eclipse : Mr. Henry Drew, Peamore Cottage, Exeter ; Major-General Drewe, The Grange, Honiton ; Mr. William Lethbridge, Courtlands, Exeter ; Major-General Talbot, Buckerell Lodge, Exeter.

Jack Tar : Mr. Wm. Coryton, M.F.H., Ermefield House, Ivy-bridge, Devon ; Mr. W. King, Southside Street, Plymouth ; Mr. R. E. Paige, St. Germans, Cornwall ; Mr. Edward St. Aubyn, Glynn, Bodmin, Cornwall.

Lancastrian : Mr. Percy E. Crutchley, Sunninghill Park, Ascot ; Sir Henry Simpson, Gordon House, Windsor ; Mr. Wm. Tait, Shaw Farm, Windsor.

DISTRICT CLASS E (Yorkshire).—8 entries. Three Queen's Premiums : No. 61, Mr. J. H. Stephenson's *Knight Templar* ; No. 62, Sir Robert Jardine's *Reveller* ; No. 63, Lord Middleton's *Spectre Lord*. Reserve : No. 59, Mr. A. O. Haslewood's *Chip Chase*.

DISTRICT CLASS F (Gloucestershire, Herefordshire, Monmouthshire, Shropshire, Staffordshire, Warwickshire, Worcestershire, and South Wales).—14 entries. Three Queen's Premiums : No. 66, Mr. T. Carr's *Crom-a-Boo* ; No. 76, Mr. John Rees's *Scherzo* ; No. 77, Mr. G. L. Abbot's *Tomahawk*. Reserve : 1st, No. 75, Mr. W. E. Litt's *Q.C.* ; 2nd, No. 69, Mr. J. E. Rees's *Ivanhoe* ; 3rd, No. 67, Mr. A. Sherratt's *Donald Caird*.

DISTRICT CLASS G (Cheshire, Lancashire, and North Wales).—8 entries. Three Queen's Premiums : No. 83, Mr. C. A. Kemble's *Sam Kheen* ; No. 84, Mr. J. E. Platt's *Silver Crown* ; No. 85, Mr. John Rees's *Snowdown* ; Reserve : 1st, No. 86, Mr. C. P. Lees's *Strathavon*.

DISTRICT CLASS H (Stirlingshire and District).—5 entries. One Queen's Premium : No. 89, Mr. R. J. Mann's *Peppermill* ; Reserve : No. 90, Mr. R. G. Waite's *Royal*.

DISTRICT CLASS I (Fifeshire, Kinross-shire, and District).—1 entry. One Queen's Premium : No. 92, Mr. W. Warren's *Royalty*.

DISTRICT CLASS J (Ayrshire, Wigtownshire, and District).—4 entries. One Queen's Premium : No. 96, Mr. J. E. Bennett's *The Muleteer*. Reserve : No. 95, Sir R. Jardine's *Strathmore*.

DISTRICT CLASS K (Roxburghshire, Berwickshire, and District).—2 entries. One Queen's Premium : No. 98, Mr. W. Wilson's *Sir Harry*. Reserve : No. 97, Mr. R. F. Trenholm's *Omega*.

It is not necessary to dwell in any detail on the merits of the animals exhibited ; but it appeared to be generally agreed that the quality of the Stallions competing for the Premiums was equal if not superior to that of the animals which have appeared before the Judges in previous years.

WOOD SHAVINGS FOR LITTER

IN the last issue of the German Agricultural Year-Book (*Land-wirtschaftliche Jahrbücher*, 1889, Vol. XVIII.), edited by Dr. H. Thiel, of the Prussian Ministry of Agriculture, appears a very interesting article by Dr. E. Ramann, Director of the Chemical Laboratory at Eberswalde, and Herr Von Kalitsch, of the Forest Department, on the results of a series of experiments made by them as to the value of wood shavings when used as litter for horses and cattle. Shavings from a considerable number of different kinds of wood were experimented with, and compared with rye-straw and peat-moss litter in respect of their power of absorbing water, the rapidity with which they decompose when mixed with earth, their respective cleanliness in the stall, and finally their manurial value.

Of these materials the peat-moss was experimented with in its ordinary condition ; the rye-straw was in pieces 40 centimetres (about 16 inches) long ; whilst the shavings were of various widths, from 2 millimetres (about .08 inch) to 4 centimetres (about 1.6 inch).

The softer kinds of wood proved to have a greater capacity for absorbing water than the straw, while the shavings from the harder woods absorbed barely as much as the straw. The width of the shavings had no material influence. When mixed with sand and moistened with tank liquid from a shippon these litter materials slowly undergo decomposition. They were all equally treated in this way, and the amount of carbonic acid evolved during the process was taken as a measure of the decomposition, the tests extending over 75 days. Judged of in this manner, fir, pine, and alderwood decompose about as rapidly as straw, birch and beech not quite so rapidly, whilst peat-moss decomposed much more slowly. In another series of experiments to determine the same property, but in which small quantities of nitrate of soda and kainit were added to the sand,

shavings, and tank liquid, the materials underwent a more equable decomposition, remaining relatively, however, in the same position to one another. In respect of their several qualifications as to softness, dryness, and cleanliness when used in the stall, they also differ considerably, wood shavings being much cleaner than peat-moss, and also, since they do not absorb so great a quantity of liquid, they are much drier for animals to lie upon. As the authors point out, the importance of these qualifications depends on circumstances. In a large stable, for instance, where there is always someone to replace any excessively wet part of the bed with fresh litter, the liability of peat-moss to become wet need not be taken into account. In small stables, however, where this cannot be looked after very closely, the wood shavings are recommended. As regards the *manurial value* of the various substances, peat-moss contains more nitrogen but less potash and phosphoric acid than rye-straw, whilst wood shavings possess a relatively intermediate value, containing about the same amount of nitrogen and more potash and phosphoric acid than the peat-moss, but less potash than straw. One point in reference to the *width of the shavings* may be noted. If they are too narrow they entangle themselves with the hoofs, but this objection is overcome if the shavings have a width of 2 to 3 centimetres ($\cdot 8$ to $1\cdot 2$ inches).

J. W. LEATHER, PH.D.

THE WEATHER OF 1889.¹

First Quarter.—The weather in *January* till the 8th day was cold, and fog was very general; from the 9th the temperature was variable, a few days together being a little above their averages, and then a few days a little below; the last few days of the month were warm. The month was mostly cloudy, with a fall of rain below the average at all stations, with very little snow, and upon the whole the month was fine.

The weather in *February* was changeable and for the most part very cold; the first day was very warm, being 12° above its average; the second day was cold, being more than 1° below its average, and from this day it was cold and unsettled, with the exception of the few days from the 14th to the 20th, which were generally warm; the end of the month was very cold and winterly. The fall of rain was in excess in some places and in defect in others. Snow fell frequently, and the month was winterly.

The weather in *March* was generally cloudy and cold. The temperature was below its average constantly till the 7th, and was variable afterwards, with a few warm days together and then a few cold days, to the end of the month. The fall of rain was generally in excess. The fall of snow during the first twelve days was fre-

¹ Abstracted from the particulars supplied to the Registrar-General by James Glaisher, Esq., F.R.S., &c.

quent, and at some places it was heavy. The melting of the snow caused great floods in Devon and Somerset on the 8th and 9th.

Second Quarter.—The weather in *April* was generally unsettled, cold, and cloudy. The temperature of the air till the 17th day was below the average, then for four days it was warm, and then cold again to the end of the month. The fall of rain was above the average. The crops at the end of the month were looking well.

The weather in *May* was generally warm, with frequent rain; the temperature of the air was cold on the 1st and 2nd days, and from the 26th, and warm on other days, particularly from the 22nd to the 25th, which were hot. The fall of rain was above its average at all the stations; at Greenwich it was 3·3 inches, and since 1815 the fall of rain has only reached or exceeded this amount on fifteen occasions. The total fall of rain at Greenwich for the five months ending May was 9·51 inches, being somewhat more than double in the same months in 1888.

The weather in *June* was very fine. The temperature of the air was above the average till the 7th, and from the 25th, and variable between those days, but generally cold. The fall of rain was below its average at all stations, excepting those between latitudes $51\frac{1}{2}^{\circ}$ and 52° . The sky was very free from clouds, and the hot sunshine caused the heavy crop of hay to be gathered in excellent condition.

Third Quarter.—The weather in *July* was generally warm and fine for the first thirteen days, then cold to the 29th, and warm on the 30th and 31st. The temperature of the air was generally above its average till the 13th day, then constantly below its average till the 29th, and above on the last two days. The fall of rain was a little above its average at some stations, and a little below at others.

The first day in *August* was fair, but the month was generally cold, with frequent rain. The temperature of the air was generally below its average between the 6th and the 28th, and at times by several degrees. Rain fell frequently till towards the end of the month, checking harvest work very much.

The weather in *September* was fine, warm, and dry till the 14th, particularly so from the 9th to the 13th; from the 15th it was cold but fine, being particularly cold from the 20th to the 26th. The temperature of the air was above its average till the 14th, with the exception of the 8th, and below it from the 15th, with the exception of the 27th, which was above the average. The fall of rain was less than the average at nearly every station. The month on the whole was very favourable for harvest work.

Fourth Quarter.—The weather in *October* was generally dull and cold, with frequent rain. The temperature of the air was below its average on every day in the month, with the exception of the 7th, 16th, and 30th. The mean temperature was $48\cdot6^{\circ}$. The fall of rain was above its average at all stations.

The weather in *November* was on the whole fine, dry, and dull, being generally very warm from the 3rd to the 25th, and cold from the 26th. The temperature of the air was below its average on the first two days, and from the 26th to the 30th. The mean temperature for the month was 44·3°. The fall of rain was small, and below its average at all stations.

The weather in *December* was generally cold till the 15th, being particularly so on the 1st, 2nd, 3rd, 4th, and 12th days; warm from the 16th to the 24th, then cold again to the end of the month. The mean temperature for the month was 37·6°. The fall of rain was a little below its average at some stations, and a little above at others. Fogs were frequent.

Hay Harvest Forecasts, 1889.—The results of the checking of the Hay Harvest Forecasts issued during the hay-making period of 1889 show that, notwithstanding the very unsettled weather which prevailed during the latter half of the period, the general percentage of successful forecasts (89) was the highest ever reached.

The telegrams were transmitted daily between 3.30 P.M. and 4 P.M. on each week-day for about five weeks, beginning on June 10 in the Eastern and Southern districts of England, and ending on August 3 over the greater part of Scotland, and a week later in Ireland.

The largest general percentage (95) was reached in the Midland Counties, while the smallest (82) was in Scotland E. and Scotland W.

SUMMARY OF RESULTS.

Districts	Names of Stations	Percentages				Total Percentage of Success
		Complete Success	Partial Success	Partial Failure	Total Failure	
Scotland, N.	Munlochy and Golspie	57	33	10	—	90
Scotland, E.	Aberfeldy, Rothiemay, and Glamis.	51	31	13	5	82
England, N.E.	Chatton and Ulceby	67	26	7	—	93
England, E.	Rothamsted, Thorpe, and Thetford	64	29	7	—	93
Midland Counties	Cirencester and East Retford	61	34	3	2	95
England, S.	Downton, Horsham, Maidstone, and Reading	60	30	10	—	90
Scotland, W.	Stranraer, Islay, and Dumbarton	52	30	14	4	82
England, N.W.	Leyburn and Prescot	53	30	12	5	83
England, S.W.	Spring Park (Gloucestershire), Clifton, Bridgend (Glamorganshire), and Glastonbury	50	40	9	1	90
Ireland, N.	Moynalty	50	40	7	3	90
Ireland, S.	Moneygall, Kilkenny, and Ard-fert Abbey	56	29	10	5	85
Mean for all districts		57	32	9	2	89

HOME PRODUCE AND FOREIGN IMPORTS IN 1889.

THE Returns of the produce of crops in the United Kingdom issued on March 13¹ render it possible to include in this number of the Journal a Table (pp. 244-5), giving the actual results of the last harvest. There is at the close of every agricultural year, considerable speculation as to the yield of the various crops, and this speculation is commonly displayed in the expression of the most conflicting opinions as to the final outcome of the season. The figures now available show that most of these opinions represented facts, but that they represented them partially—that, in short, the experience of one district was very different from that of another. Without attempting to analyse the Returns, this point may be briefly indicated. For the purpose of the Returns England is partitioned into four divisions, and the figures are given separately for each. It now appears that there was a wide difference between Division I., which comprises the Eastern counties, and Division IV., which comprises the North and North-western counties. In the former all the cereal and pulse crops were below the average, and in the latter they were all above the average. This can best be shown by the percentage of yield below and above an average yield per acre in each case:—

Crop	Division I. Eastern counties <i>Below average</i>	Division IV. North and North-western counties <i>Above average</i>
	Per cent.	Per cent.
Wheat	4·02	18·50
Barley	13·64	5·38
Oats	5·05	1·13
Beans	10·77	5·03
Peas	13·49	3·13

Division II., which includes the Home counties and the South-east of England, had rather better crops than Division I., but they were all less than the average, with the exception of wheat. On the other hand, in Division III. (Western counties) the yield, though not so good as in Division IV., was above the average in every case, except peas.

In the official summary of the Returns, it is remarked that the cereal crops “varied greatly in their yield throughout Great Britain, though the reports as to quality, except as to barley, are generally favourable. Root crops are referred to in many of them as being conspicuous both in regard to abundance and quality, while the hay crop is almost universally mentioned as being one of the finest crops obtained for a long time.”

¹ Parliamentary Paper, C. 5945 (Eyre & Spottiswoode, East Harding Street, Fleet Street, E.C.) Price 4d.

The aggregate results for wheat in Great Britain in the year 1889 were brought up altogether to 73,202,773 bushels, as compared with 71,939,647 bushels in the preceding year, the estimated average yield per acre in 1889 being 29·89 bushels, against 28·05 bushels in 1888, showing an increase in the total production of 1,263,126 bushels, or 1·76 per cent., and an increase in the yield per acre of 1·84 bushels, or 6·56 per cent.

Among the root crops the rate of yield for potatoes in 1889 exceeded the estimated ordinary average in Wales and Scotland, but was lower in England by 0·24 of a ton per acre, the result for the whole of Great Britain being, in 1889, 0·08 of a ton higher than the standard. The gross produce in 1889 amounted to 3,587,765 tons, against 3,059,124 tons in the previous year, when the area so planted was, however, 10,900 acres more. In a large number of districts they were reported as being a bulky crop and generally of excellent quality. Mention was made of yields of fully nine tons per acre having been grown even on inferior sand land, but which had been well manured.

The Imports for the past three years of food and other products which come into competition with, or in other ways directly affect, British agriculture are set forth in Table II. (pp. 246 and 247). These figures will repay careful study. Generally speaking, the most notable fact is the great increase in the importations of meat, and especially of fresh beef and mutton, during the year 1889. Judging by the figures here given, the dead-meat trade is increasing by leaps and bounds, the quantity of fresh beef and mutton imported having been very nearly doubled in the course of three years.

The number of cattle which were landed "on the hoof" showed a considerable increase in 1889, as compared with 1888; but there was a marked falling off in the number of sheep. Taking all kinds of meat, alive or slaughtered, fresh or salted, there was an increase of something like 70,000 tons in weight, and of nearly 6,000,000% in value, in the imports of 1889, as compared with the previous year. The imports of grain are, of course, subject to fluctuations consequent upon the home yield of particular crops. The total quantity of "bread-stuffs"—that is, wheat and flour reckoned together—imported showed very little change during the three years given in the table, though the quantity was somewhat less in 1889 than in either 1887 or 1888. The imports of dairy produce and eggs still continue their steady progression of annual increase, though there is some hopefulness to be gathered from the fact that the quantity of foreign cheese was slightly less in 1889 than in the previous year. The most encouraging token—from the point of view of the home producer—is, perhaps, to be found under the heading of fruit and vegetables, the distinct diminution of the imports of apples, "unenumerated" fruit, and potatoes being, it may be hoped, an indication that the home growers are at length commencing to make headway against their foreign rivals in the markets of the country.

TABLE I.—ESTIMATED TOTAL PRODUCE AND YIELD PER ACRE OF THE
AND NUMBER OF HORSES, CATTLE, SHEEP, AND PIGS, IN

[From the Agricultural

Crops	England						Wales					
	Acreage, 'thousands' (000) omitted		Produce of crops, 'thous- ands' (000) omitted		Yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thous- ands' (000) omitted		Yield per acre	
	1888	1889	1888	1889	1888	1889	1888	1889	1888	1889	1888	1889
CORN CROPS:—	Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush.	Bush.
Wheat	2,419	2,322	68,159	68,336	28.18	29.87	77	68	1,641	1,672	21.36	24.43
Barley or Bere	1,742	1,776	57,740	56,037	33.14	31.55	118	122	3,111	3,548	26.39	29.07
Oats	1,616	1,624	64,836	68,109	40.11	41.94	250	249	7,521	8,150	30.02	32.73
Rye	64	59	—	—	—	—	1	1	—	—	—	—
Beans	321	304	9,267	8,693	28.63	28.55	2	2	48	47	25.79	28.92
Peas	238	222	5,784	5,640	24.30	26.32	2	1	35	31	16.75	21.16
TOTAL CORN CROPS .	6,400	6,307	—	—	—	—	450	443	—	—	—	—
GREEN CROPS:—			Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons
Potatoes	391	385	2,104	2,337	5.38	6.08	42	40	188	238	4.50	5.95
Turnips and Swedes . .	1,391	1,370	17,549	19,225	12.61	14.03	72	72	907	1,083	12.57	14.99
Mangolds	352	318	6,112	5,978	17.36	18.79	8	7	109	122	14.05	17.53
Carrots, Cabbage, Kohl- rabi, and Rape . . . }	168	141	—	—	—	—	1	2	—	—	—	—
Vetches, &c.	380	294	—	—	—	—	4	3	—	—	—	—
TOTAL GREEN CROPS	2,680	2,518	—	—	—	—	127	124	—	—	—	—
OTHER CROPS, GRASS, &c.:—												
Clover and artificial grasses and permanent pasture }	9,575	8,420	—	—	—	—	1,568	1,573	—	—	—	—
Ditto for hay	5,787	6,168	8,273	9,692	—	—	679	695	721	781	—	—
Flax	2	2	Cwts.	Cwts.	Cwts.	Cwts.	—	—	—	—	—	—
Hops	53	57	281	498	4.81	8.62	—	—	—	—	—	—
TOTAL OTHER CROPS.	15,422	15,647	—	—	—	—	2,247	2,267	—	—	—	—
Live Stock	Year 1888		Year 1889		Year 1888		Year 1889					
	Actual No.		Actual No.		Actual No.		Actual No.					
Horses	1,091,500		1,091,041		139,003		141,143					
Cattle	4,352,826		4,352,657		666,359		668,101					
Sheep	15,788,794		15,839,662		2,737,788		2,840,069					
Pigs	2,018,420		2,118,385		231,365		240,741					

NOTE.—The produce of the Corn Crops for Ireland, which was originally given in weight, has been converted
60 lb. to the bushel of Beans and Peas.

PRINCIPAL CROPS, AND ALSO THE ACREAGE UNDER OTHER CROPS AND GRASS,
THE UNITED KINGDOM IN THE YEARS 1888 AND 1889.

Produce Statistics.]

Scotland						Ireland						United Kingdom					
Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Yield per acre	
1888	1889	1888	1889	1888	1889	1888	1889	1888	1889	1888	1889	1888	1889	1888	1889	1888	1889
Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush.	Bush.
69	59	2,139	2,194	31.12	36.94	99	50	2,553	2,651	23.79	29.87	2,663	2,539	74,295	73,863	27.97	29.69
225	223	7,631	7,842	33.66	35.09	171	186	6,063	7,277	35.39	39.07	2,257	2,306	71,545	71,704	33.03	32.37
1,015	1,016	31,987	37,152	34.46	36.61	1,280	1,239	50,632	50,637	39.53	40.87	4,163	4,128	157,970	164,078	37.95	39.75
10	9	—	—	—	—	14	16	—	—	—	—	80	85	—	—	—	—
16	15	410	508	26.02	34.10	5	4	119	125	23.47	31.05	344	325	9,844	9,373	29.61	28.67
1	1	27	65	15.79	24.85	1	1	16	15	22.11	22.46	242	226	5,862	5,921	24.50	26.27
1,335	1,323	—	—	—	—	1,570	1,555	—	—	—	—	9,735	9,611	—	—	—	—
		Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons
157	155	707	1,012	4.87	6.34	805	787	2,523	2,947	3.14	3.62	1,395	1,366	5,352	6,435	4.00	4.71
451	478	6,210	7,769	12.94	10.30	2,204	2,298	3,327	3,910	11.31	13.12	2,238	2,216	25,002	32,007	12.61	14.43
1	1	14	19	13.21	17.21	46	44	590	622	12.96	14.12	407	370	6,829	6,740	16.78	18.21
8	9	—	—	—	—	52	52	—	—	—	—	230	216	—	—	—	—
15	14	—	—	—	—	37	36	—	—	—	—	436	351	—	—	—	—
663	657	—	—	—	—	1,234	1,219	—	—	—	—	4,706	4,521	—	—	—	—
2,238	2,280	—	—	—	—	9,905	9,995	—	—	—	—	23,362	23,390	—	—	—	—
602	601	957	954	—	—	2,222	2,187	5,181	4,954	—	—	9,291	9,651	15,133	16,284	—	—
—	—	—	—	—	—	114	114	—	—	—	—	116	116	Cwts.	Cwts.	Cwts.	—
—	—	—	—	—	—	—	—	—	—	—	—	56	56	281	498	4.81	6.02
2,860	2,657	—	—	—	—	12,241	12,292	—	—	—	—	32,771	33,155	—	—	—	—
Year 1888		Year 1889		Year 1888		Year 1889		Year 1888		Year 1889		1888		Year 1889			
Actual No. 168,787		Actual No. 169,505		Actual No. 507,301		Actual No. 516,168		Actual No. 1,927,561		Actual No. 1,936,577							
1,110,280		1,120,797		4,099,941		4,093,944		10,223,616		10,233,499							
6,730,567		6,851,449		3,626,780		3,789,699		28,883,929		29,421,649							
154,559		151,677		1,397,800		1,390,548		3,802,144		3,861,351							

into bushels, at the rate of 60 lb. to the bushel of Wheat; 50 lb. to the bushel of Barley; 39 lb. to the bushel of Oats; and
* Turnips only.

* Including Beerroot.

TABLE II.—QUANTITIES AND VALUES OF IMPORTS OF CORN, MEAT, YEAR 1889, WITH THE COMPARATIVE

(Compiled from the Trade

	Quantities			Values		
	1887	1888	1889	1887	1888	1889
ANIMALS, LIVING (for food):—	No.	No.	No.	£	£	£
Oxen and Bulls . . .	219,222	287,366	441,811	3,802,655	5,130,837	8,133,468
Cows	38,766	49,724	60,366	489,063	634,982	732,365
Calves	37,973	40,098	53,044	147,087	146,155	203,454
TOTAL CATTLE . . .	295,961	377,088	555,221	4,438,805	5,911,974	9,069,307
Sheep and Lambs . . .	971,403	956,310	678,058	1,645,837	1,740,549	1,195,407
Swine	21,965	24,509	25,324	64,424	74,784	95,273
TOTAL	1,289,329	1,577,807	1,258,603	6,149,066	7,727,307	10,360,087
CORN:—	Cwts.	Cwts.	Cwts.			
Wheat	55,784,685	57,224,934	58,602,271	21,325,902	21,971,331	22,530,838
Wheat-meal and Flour .	18,056,545	16,912,773	14,699,201	10,020,433	9,530,800	8,559,563
Barley	14,277,180	21,277,477	17,415,943	3,769,272	6,069,190	4,968,947
Oats	14,468,733	13,737,436	15,999,060	3,489,818	4,588,712	4,472,598
Peas	2,990,296	2,420,347	1,688,512	875,016	705,747	553,503
Beans	2,477,293	3,010,144	3,585,473	787,976	920,088	1,123,233
Maize	31,123,401	25,338,551	36,203,069	7,535,946	6,881,307	8,580,080
Maize-meal	5,522	14,846	24,066	4,934	8,046	19,365
TOTAL	139,183,855	144,987,068	148,217,595	47,819,297	50,675,221	50,808,127
MEAT:—						
Beef, Salted	218,437	226,536	264,542	334,050	349,259	371,580
„ Fresh	657,574	837,444	1,379,511	1,481,183	1,920,947	3,015,180
Mutton, Fresh	764,841	969,065	1,226,669	1,576,801	1,940,979	2,578,621
Bacon	3,000,811	2,854,536	3,498,144	6,329,890	6,392,959	7,287,207
Hams	930,617	728,305	977,608	2,390,051	1,923,936	2,501,484
Pork, Salted (not hams) .	273,832	244,891	269,587	393,221	359,921	390,265
„ Fresh	153,735	242,778	116,846	379,803	556,954	286,139
Meat, unenumerated— Salted or Fresh . . .	47,035	56,781	90,982	115,650	120,551	197,017
Meat preserved otherwise than by Salting . . .	519,180	542,599	642,357	1,349,985	1,377,023	1,632,333
Rabbits	117,058	100,872	123,774	311,866	276,562	341,493
TOTAL	6,693,120	6,823,827	8,590,520	14,662,100	15,218,991	18,601,809

FOOD PRODUCTS, AND ARTICLES AFFECTING AGRICULTURE, IN THE
FIGURES FOR 1887 AND 1888.*and Navigation Accounts.)*

	Quantities			Values		
	1887	1888	1889	1887	1888	1889
DAIRY PRODUCE:—	Cwts.	Cwts.	Cwts.	£	£	£
Butter	1,514,905	1,669,314	1,927,469	8,016,769	8,902,193	10,243,726
Margarine	1,273,095	1,133,174	1,240,760	3,869,948	3,263,826	3,652,722
Cheese	1,834,467	1,917,541	1,909,545	4,508,937	4,542,278	4,494,554
TOTAL	4,622,467	4,720,029	5,077,774	16,395,654	16,708,297	18,391,004
POULTRY, &c.:—						
Poultry and Game, alive or dead	—	—	—	409,183	403,197	472,686
Eggs	Gt. Hunds. 9,069,837	Gt. Hunds. 9,320,617	Gt. Hunds. 9,416,633	3,080,561	3,077,109	3,122,813
TOTAL	—	—	—	3,489,744	3,480,306	3,595,499
FRUIT, VEGETABLES, &c.:—	Bushels	Bushels	Bushels			
Apples (raw)	1,948,843	3,621,946	3,617,997	565,392	1,037,084	976,118
Fruit, unenumerated (raw)	2,479,004	3,039,100	2,189,508	1,167,095	1,367,271	1,149,834
Onions	3,619,471	3,479,418	3,862,751	617,710	641,266	674,547
Potatoes	2,762,958	2,384,144	1,864,610	974,133	802,110	735,999
Vegetables, unenum- erated (raw)	—	—	—	600,882	621,771	623,789
Hops	Cwts. 145,298	Cwts. 215,927	Cwts. 200,690	428,250	796,404	716,637
TOTAL	—	—	—	4,353,462	5,265,896	4,876,924
OTHER ARTICLES:—	Cwts.	Cwts.	Cwts.			
Lard	906,190	883,469	1,193,331	1,601,635	1,815,420	2,178,408
Flax	1,560,696	1,833,650	1,733,189	2,707,814	2,991,898	3,066,114
Wool	574,186,058	635,936,244	696,396,186	24,280,593	25,897,745	28,393,755
Wood & Timber :						
Hewn	1,715,343	1,985,249	2,389,491	3,235,230	4,042,407	5,635,118
Sawn or Split, Planed or Dressed	3,793,677	4,336,084	5,313,750	7,885,955	9,638,077	13,142,533
Staves	137,410	143,872	170,155	563,768	590,113	664,115
Oil-Seed Cake	268,694	269,873	266,295	1,560,493	1,620,634	1,703,521
Seeds: Clover and Grass .	338,858	334,432	296,314	693,426	664,185	608,097
" Cotton	276,570	255,500	289,413	1,543,645	1,646,349	1,940,995
" Flax and Linseed .	2,341,175	2,542,027	2,272,019	4,296,968	4,800,016	4,577,799
" Rape	413,856	279,615	458,948	457,999	448,254	820,273
TOTAL	—	—	—	48,827,428	54,175,067	62,760,836

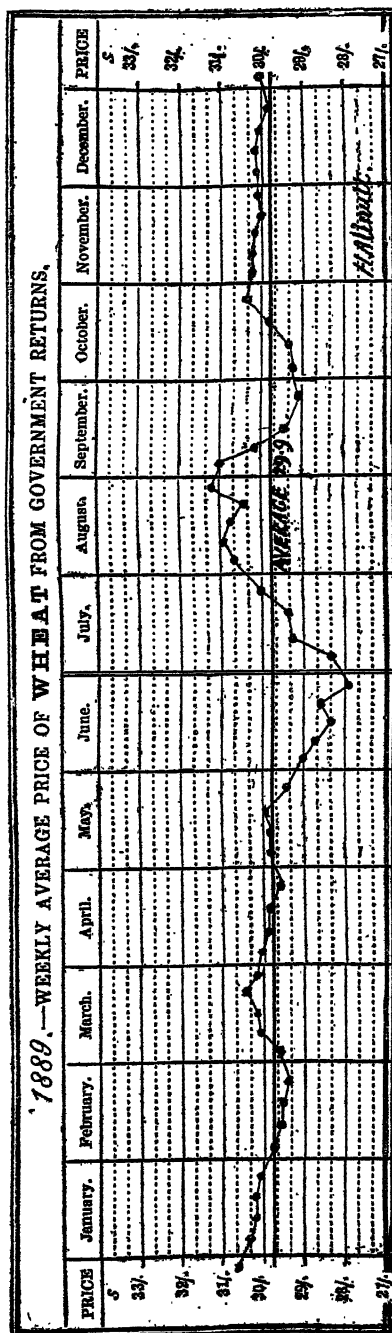
THE PRICE OF WHEAT IN 1889.

AVERAGES FOR 1889.

	s.	d.
Wheat	29	9
Barley	25	10
Oats	17	9

THE annual Imperial average price of wheat has declined 2s. 1d. a quarter from that of 1888. In the latter year the average was 31s. 10d., whereas in the past year it was 29s. 9d. The weekly fluctuations have been very slight, only ranging to 3s. 3d.—in 1888 the range was 8s. 1d. Ten years back, viz., in 1879, the lowest weekly average was 37s. 8d. and the highest 50s. 4d., a difference of 12s. 8d. The annual average for that year was 43s. 10d. Ten years later the average has fallen 14s. 1d. a quarter, a most serious decline. The lowest weekly average in the past year was on June 29, 27s. 11d., and the highest on August 31, 31s. 2d., the average for 1889, as already mentioned, being 29s. 9d. a quarter. The price of barley was above that of wheat during the four weeks in October last and for the first three weeks of November, but barley was especially low on July 13, being only 19s. 9d. a quarter. The annual Imperial average price of corn was—wheat, 29s. 9d.; barley, 25s. 10d.; oats, 17s. 9d. The septennial tithe rent-charge is 2l. 18s. 5d. per 100l. lower this year than last, it being 78l. 1s. 3½d., whereas last year it stood at 80l. 19s. 8½d. The average from the commutation in 1836 is 101l. 2s. 3½d.

HENRY ALLNUTT.



RECENT AGRICULTURAL INVENTIONS,

The subjects of Applications for Patents from January 1 to March 15, 1890.

INVENTIVE genius has been greatly stimulated, since 1883, by the large reduction in the cost of obtaining a patent, which was one of the principal features of the Patents, Designs, and Trade Marks Act of that year. The number of applications for protection have, in consequence, increased annually, the total for the year 1889 having amounted to close upon 21,000. Of this number, a considerable proportion relate to inventions affecting the interests of members of the Society in their various occupations. It has, therefore, been decided, in the new series of the Journal to publish every quarter a list of such inventions connected with agriculture, compiled from the Official Journal of the Patent Office.

In order that readers of the Journal may better understand these lists, and how best to utilise the information they give, some general explanation of the proceedings at the Patent Office may here be useful.

Each application for a patent is accompanied by a specification describing the invention, such specification being either "provisional," or "complete," as the case may be, according to whether the applicant desires only provisional protection for nine months, or a complete patent for four years. Should the inventor decide, eventually, not to go beyond the provisional stage (for he may file his "complete" any time within nine months), or, in other words, abandon his application for a patent, the particulars of the invention are not disclosed to the public; but if otherwise, and the complete specification is "accepted" by the Office, it is open to public inspection. Copies of such specifications, with photo-lithographic reproductions of the drawings (if any), are on sale at the Patent Office Sale Branch, about three weeks after the date of acceptance, and may be obtained, if desired, through the post, by forwarding the price, plus the postage, in stamps. Within two months from the official advertisement of acceptance of a specification, any person who desires to oppose the grant of the patent may do so by giving notice to the Comptroller, who accordingly affords a "hearing" to the two parties, and gives his decision on the case. If no such opposition occurs, the patent is usually sealed within three months from the date of acceptance of the complete specification.

To each list of inventions published in this Journal will be appended a list of the numbers of the specifications on sale at the time of going to press, with the price subjoined in brackets (the postage being, in nearly every case, $\frac{1}{2}$ d.). With the information given above, therefore, any reader who is interested in one or more of the subjects before him may, by waiting until he sees the publication of the same announced, obtain a copy of the specification, with the full particulars of the invention. If, at the expiration of fifteen months, the number does not appear in the list of specifications published, he will know that the application is either abandoned or under opposition.

Agricultural Machinery and Implements, &c.

No. of Application	Name of Applicant	Title of Invention
140	SLEEP, W. H. and R. H.	Ploughs.
288	TALBOT, D. H.	Machines for stacking hay, ensilage, &c.
385	BIRTWISLE, W.	Mowing and reaping machines.
536	HOLT, J.	Potato diggers and separators.
666	BONNARD, T.	Cleaning wheat and other grain.
868	VALADIN, E. M.	Machine for clipping hedges.
943	WISE, W. L.	Steam-ploughs.
960	SAUNDERSON, H. P.	Dressing-machines for cleaning corn, seeds, &c.
1199	WOODVILLE, G.	Machine for pressing and trussing hay and straw.
1208	WILSON, J.	Bins or silos for storing grain, &c.
1342	HUBNER, C. F. P.	Horse-gears.
1370	WOLSELEY, F. Y.	Cutters and combs for sheep-shears, horse-clippers, &c.
1455	JENKS, T.	Machines for mowing grass.
1507	HARDINGHAM, G. G. M.	Harvesters.
1508	HARDINGHAM, G. G. M.	Sheaf-carriers for harvesters.
1532	HORN, W. W.	Potato digger and picker.
1711	HARDINGHAM, G. G. M.	Harvesters.
2001	STATHAM	Root-cutting machines.
2006	TAYLOR, F.	Ploughs.
2093	STEVENSON, A.	Separating or sieving grain, &c.
2175	RUTLEDGE, J.	Cultivating land either by horse or steam power.
2304	DAVISON, R.	Mechanical presses for baling hay, straw, &c.
2376	BOULT (NOXON)	Seeding-machines.
2405	KRONMAN, H. P. O. J.	Sowing seeds and scattering manure.
2677	ROBERTSON, E. J.	Elevator and gear to raise and weigh grain.
2719	BEHRINGER, A.	Combined measuring, mixing, and distributing hoppers or machines for corn, grain, &c.
2902	INGRAHAM, W. W.	Machine for clipping, scouring, cleaning, grading, and separating grain.
3000	BONNE, C. R.	Machine for drying grain, seed, &c.
3059	LEE, J.	Spade-handles.
3642	BAWDEN, R.	Ploughs.
3751	ANTHONY, J. S.	Roofing hay or corn stacks.
3779	EDWARDS, E.	Tightening silage press chains.
3862	PASS, E.	Agricultural rake-teeth.
3988	STRETTON W. G.	Hay-turning machine.

Stable Utensils and Fittings—Horse-shoes, &c.

130	SWINDELL, F. C.	Horse-shoes.
184	KING, H. E., and another	Harness.
194	JEWETT, M. O.	Horse-shoes.
238	EDWARDS, E. W.	Improved horse-shoe.
435	JACKSON, A.	Rein dees and turrets for harness.
513	HAKEN, J.	Horse-shoes.
760	TOWNSEND and another	Horse-shoes.
888	STANCK, B.	Feeding-trough for horses, &c.
891	GUEST, S.	Instantly releasing horses from carriages in case of accident.
979	TOTHRILL, T. H. F.	Holding horses and harness, and stopping run-away horses automatically.
1081	PICKERING, W.	Horse-shoes.
1175	GRAINGER, A.	Nailless horse-shoes.
1205	FELLOWS, A.	Hame-fasteners.
1243	CARMONT, C. K.	Horse-shoes.
1305	BAILEY, C. and L. L.	Appliance for feeding horses, &c.
1373	RITCHIE, J.	Saddles.

No. of Application	Name of Applicant	Title of Invention
1448	GRAHAM, D.	Blind-hoods for horses.
1464	WATKINS, B.	Horse-shoes.
1491	TURNER, G. H.	Roughing the shoes of horses.
1554	CAFFERO, G.	Electrical head-piece and reins
1739	STONE, C. S.	Horse-shoes.
1787	HARRIES, T. D., and o's	Safety stirrup-bar for saddles.
1835	WHEELER, H. B.	Safety stirrups.
1850	ANNAT, K.	Inflated pad for the hoofs of horses.
1953	BOULT, A. J.	Buckles for bridles, traces, &c.
1969	MACLELLAN, P.	Horse-hoof pad.
2025	WINCEB, C.	Shaft tug-buckles, &c.
2026	BENFIELD, J. and others	Horse-shoes.
2049	HORN, W. W.	Horse-blanket fastening.
2147	JUTSON, C. J., and F. POUFARD.	Nailless horse-shoes.
2403	WILLIAMSON, C.	Web halter-heads for horses and cattle.
2630	MCCULLOCK, L.	Harness for horses, &c.
2651	BARNETT, L.	Ankle boot or pad for horses.
2726	KENNEDY, J.	Shoeing horses, &c.
2817	GOTZE and another	Horse-shoe calks.
2857	BRIDGE, T. H.	Mangers.
2884	HALL, H.	Releasing runaway horses from carriages.
2909	ROSE, W.	Shoes for horses and other animals.
3002	WEBER and another	Stirrups.
3141	PARKINSON, G. M., & an'r	Preventing horses from running away.
3296	WHATMOUGH, J.	Studs for horse-shoes, to prevent slipping.
3709	SQUIER, F. W.	Riding saddles.
3727	POND, C. P.	Bridle-bit.
3873	ALPASS, J. C.	Cart saddle gearing.

Carts and Carriages.

388	HOUGHTON, J.	Endless chain-break for carts.
596	FLEETWOOD, C. J.	Preventing vehicles falling or turning over when a wheel comes off or axle breaks.
876	DARLING, J. and A.	Break.
895	SYMONS, W., & another	Vehicles.
898	NEWMHAM	Carriages for common roads.
1251	DUTTON, C.	Shackles employed in vehicular construction.
1270	MOSS, W. C.	Method of releasing, fastening, and moving seats
1785	HANNAFORD, C. E.	Self-registering cart-weighing machine.
1807	STOREY, R.	Drawing-gear of carts and other vehicles.
2501	WRIGHT, R.	Carts.
2638	HILL, T.	Spring pedestal-bearings for vehicle-axes, &c.
2718	STENNING, E.	Gigs, cars, and other open vehicles.
2752	PIERCE, W. J.	Prevention of the overturning of road vehicles.
2823	PEARCE, G. H.	Stocks or hubs and spokes of wheels.
2882	OFFORD, J. J.	Wheel-carriages.
3014	ELDEEDGE, E. F.	Wheel-tires.
3941	NEWBOLD, C.	Friction brake for carts, &c.

Dairy Utensils, &c.

48	HOLMES, G. R.	Butter and cheese cutter.
53	WOOD, W.	Butter-moulding machine.
94	SNAYDON, W.	Cheese-vat.
320	GRONWALD and another	Milk-cans.
459	MITCHELL, J. D.	Butter spoons and rollers.
807	STOREY, J. T.	Revolving butter-stand—"The Economic."

No. of Application	Name of Applicant	Title of Invention
1082	TOPP, G. C.	Preventing lactometers rotating, and strengthening same.
1186	SMITH, G., and another	Machine for forming butter and cheese into pats.
1326	SCHMIDT-MÜLHEIM, A.	Production and preservation of sterilised milk.
1328	APPLEBERG, J. T.	Apparatus for preserving and purifying milk.
1381	MCHARDY, W. & J.	Cheese-taster.
2561	LAKE, H. H.	Apparatus for making butter.
2574	SALTER, G., and others	Machine for putting up butter in prints.
2593	PAIN, J.	Machine to blend or mix butter.
2850	ASHWORTH, J.	Canning and preserving butter, &c.
3103	MCDONNELL, W.	A new means of inspecting or sampling butter contained in casks or firkins.
3208	INGRAM, F. J., & another	Milk-delivery cans, &c.
3218	WHITE, J.	Tightener for butter-casks, &c.
3228	BRADFORD, T.	Churns.
3545	BRADFORD, T.	Apparatus for working butter, &c.

Poultry and Game, &c., Appliances.

461	ELLIS, J. W.	Mothering and rearing game and poultry chicks.
955	PFAFF, H.	Incubators.
2300.	BROWN, D.	A new process for preserving eggs.
3557	SPICER, E., and another	Improved nest-eggs.
3750	SCHÖNEMANN, A.	Apparatus for killing fowls.

Miscellaneous.

406	CARRUTHERS, J. F.	Trap for rabbits.
573	CLIPSHAM, J. J.	Trap for rabbits.
575	GINSTER, M. C.	Manufacture of manure from organic matter.
889	CRAIG, G.	Sheep-dip.
919	BARLOW, J., & another.	Self-setting trap for catching vermin alive.
1090	WILCOX, J. B.	Beehives
1228	ANDREWS, H.	Improved animal-trap.
1392	GIBB, D. D.	Preventing cattle from goring—designated "Horn buffers"
1471	CALTHORP, F. C.	Oil-cake.
1643	BARNES, E.	Facilitating singeing pigs and other carcasses.
2095	LANG, G.	Fencing in of farmyards and produce.
2252	BURGON, C. and H.	Shearing or clipping sheep, &c.
2265	PIPE J., and another	Compound for treating vines and other plants for prevention of phylloxera, mildew, &c.
2303	COKER, H., and others.	Lotion for curing mange and other skin diseases in horses, dogs, &c.
2348	PEARSON, T. D.	Droppers or standards for wire-fencing.
2686	BOWN, W., and another	Appliance for shearing or clipping wool, hair.
2780	MCLAREN, D.	Seed-germinator.
3111	BLINKHOEN, F. J.	Apparatus for distributing dry lime, dust, or hellebore powder on to plants and trees.
3134	MCDUGALL, I. S. and J. T.	Compound for washing or dipping sheep, &c. for the extermination of parasites.
3166	WHITEHOUSE, T. G.	Preparation of food for cattle and horses.
3416	DAVIS, B. W.	Device for preventing moths, caterpillars, &c., from ascending fruit-trees.
3553	PEARSON, J. R.	Protecting crops from destruction by rooks, &c.

Numbers of Specifications Published

(with Prices in parentheses).

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OBITUARY NOTICES OF DECEASED MEMBERS.

Mr. Herbert J. Little.

Few tasks are so painful to undertake or so difficult to discharge as that of writing an obituary notice of a departed friend and fellow-worker. During a short official experience of less than three years it has fallen to the lot of the present Editor to chronicle in one form or another the deaths of no less than ten Members of the Council of the Society. He has now to record in the opening pages of a new Quarterly Journal the untimely decease of another most valued and esteemed Member of Council, Mr. Herbert Little, of Coldham Hall.

Born on November 17, 1835, at a small hamlet in the Isle of Ely, called Edernell, where his relations had occupied a farm for nearly half a century, Herbert John Little returned when his schooldays were over to the family home to learn farming under his father. There he spent the next eight years of his life. He inherited from his father a good eye for cattle, and later on his judgment was matured by association with his father-in-law, Mr. John Brown, of Coldham Hall, who was a notable judge of stock. But the science of agriculture seems to have had for him as great charms as its practice. He acquired a considerable knowledge of agricultural chemistry, whilst meteorology had for him quite a fascination. During a period of twenty-five years he regularly recorded the rainfall, and he frequently contributed notes on the weather to the newspapers.

At the age of twenty-four Mr. Little became himself the occupier of a farm of 500 acres at Wisbech St. Mary's, where he had during the first two or three years of his occupation some particularly trying experiences with the weather. Seven years later he went to Thorpe lands, near Northampton, on the estate of Lord Overstone, and after five years of farming there he migrated to the farm of his father-in-law at Coldham, where the remaining eighteen years of his life were passed.

Mr. Little's vocation as a farmer does not appear, even in difficult times, to have wholly engrossed his attention; and he found many additional outlets for his energy and cultivated tastes in the study of English literature and music—he had played the piano from an early age, and was a performer on, and even a designer of, the organ—and in attending farmers' clubs and Chambers of Agriculture, reading papers on "Local Taxation," "Education of the Agricultural Labourer," "Local Dialects," and so forth.

He became in 1868 a candidate for the post of Secretary and Editor of the Royal Agricultural Society, and was one of the seven selected candidates who had an interview with the Committee. Although he was not chosen for this appointment, the work of the "Royal" seems to have had a considerable interest for him, for he became a Member in 1870, and in 1871 made his first appearance in this Journal with an elaborate and very well written paper on the then burning question of Sewage Farming. As the reporting

Judge of the farm prize-competition in Warwickshire in 1876, he wrote a report marked by his customary care and exhaustiveness ; and so well was this thought of that, four years later, he was entrusted with a similar report on the farm competition in Cumberland and Westmoreland (1880).

In connection with these farm-prize competitions, about which to the last he was always regarded in the Council as a great authority, a curious topographical facility of his must be noted. For many years topography was perhaps his most absorbing study. He was able to indulge his taste for travel to some extent by several tours in Scotland, Ireland, France, Italy, Switzerland, Austria, and Germany, where he visited many of the chief scenes of interest, and explored many places remote from the track of the ordinary tourist ; but his knowledge of other countries, and indeed of his own country, was by no means confined to what he had seen. He had studied maps and guide books, and histories and travels. He knew the locality of almost any place named, what was to be seen there, what had happened there in the past, and how it was to be reached. He was kind enough to undertake the duty of mapping out the itinerary for the Judges of farms for the Nottinghamshire Farm Competition in 1888 ; and he volunteered a similar kindness for the Devon and Cornwall competition of the present year. His itinerary for this inspection was probably one of the latest pieces of work to which he was able to set his hand. It was constructed with surprising knowledge of the country and of the means of locomotion in a thinly-populated district, badly served by railways ; and revealed an intimacy with the mysteries of Bradshaw as unusual as it was enviable.

Other contributions of Mr. Little to the Journal were the article on the Agricultural Labourer—his history, wages, expenses, domestic life, daily work, and education—contributed to the memoir on the Agriculture of England and Wales prepared by the Society for the International Agricultural Congress of 1878 ; a detailed report on the working-dairy at the Derby Show in 1881 ; a review of Mr. Jenkins's Report to the Technical Commission on Agricultural Education, which appeared in two parts in the volume for 1885 ; and a report as Senior Steward of Implements at the Newcastle Meeting of 1887.

In December 1881 he accepted an invitation to a seat on the Council of the Royal Agricultural Society, and for the next eight years he was an active participant in the varied work of the Council, serving on the Journal, Chemical, Seeds and Plants, Implement, and Education Committees, and contributing importantly to the deliberations of each. About the same time as he became a Member of Council he was appointed to the Professorship of Agriculture at the Royal Agricultural College at Cirencester. His first course of lectures was delivered in May 1882, and from that time until last November he contributed three courses of lectures in the year.

For several years before his death he had been an active member of the Committee of the Farmers' Club, and a frequent speaker at its

meetings. At the end of 1888 he was elected Chairman of the Club for 1889, and presided at each of the meetings held during that year. The annual dinner of the Club and the Council Meeting of the Royal Agricultural Society, held in the Smithfield week, were his last public appearances. Those who knew him well thought that he had seldom seemed more vigorous, buoyant, and cheerful; and the writer well remembers the spirit with which he entered into the interesting discussions of the Education Committee of the Society held in that week, at which he took the chair. About a week later, however, he appeared to have caught a cold, and was confined to his house, which he never left again. At first no serious alarm was felt; but on January 17 graver symptoms were developed, on the 26th danger became imminent, and on the 30th the end came. The news of his unexpected and premature death came as a great blow to all his colleagues, and the President (Lord Moreton) at the Meeting of Council held on February 5 expressed the universal regret of the Council at his loss.

By the death of Mr. Little the Council has indeed been deprived of one of its most active, energetic, and devoted Members. His wise counsels were always in request at Hanover Square; and his opinion invariably carried great weight in Committee, as that of a practical, sensible, and eminently clear-headed man. No one ever asked for his help and assistance in vain. He was always accessible, always sympathetic, always constructively helpful; and it is no mere form of words to say that his death leaves a perceptible gap, which it will be difficult to fill up.

E. C.

M. F. Robiou de la Trehonnais.

M. de la Trehonnais, who had been a member of this Society since 1854, died at the Château de Saron, Marne, on the last day of 1889. M. Trehonnais was a frequent visitor to the Society's Shows, and wrote many reports upon them for French periodicals. His best-remembered appearance in this country was at the Chelmsford Meeting of 1856. At that Meeting there were classes for foreign cattle and sheep, which could only be competed for by animals bred abroad; and quite a large deputation of French, Belgian, Swiss, and other foreign agriculturists, including M. Trehonnais and our distinguished Honorary Member, M. Tisserand, were present at the annual dinner which it was then the custom to hold. Enthusiasm appears to have been the order of the day on this occasion; for we read that the Duke of Richmond was "greeted with an immense burst of cheering, which was continued for several minutes," and that "tremendous applause and three times three" followed M. Trehonnais' long and eloquent speech, delivered in English, in which he called upon the 1,000 gentlemen assembled, "to whatever nation you belong, whatever may be your social position, and whatever your influence, upstanding as in the presence of majesty, to raise from the inmost recesses of your hearts a mighty shout of 'Hail and Success to the Royal Agricultural Society of England.'"

For many years M. Trehonnais had, by his writings on English and French agriculture, contributed to the maintenance of a friendly intercourse between the farmers and breeders of the two countries. The *Journal d'Agriculture Pratique* (January 16, 1890) remarks that he was "incontestably the French writer who best knew English agriculture." He especially interested himself in the improvement of live-stock, and the introduction of improved British varieties—notably shorthorns—into France. In his *Revue Agricole de l'Angleterre*, published in 1859, he gave an interesting and highly appreciative account of the history and work of "la Société Royale d'Angleterre" up to that date. In 1876 M. De la Trehonnais wrote an account of the Paris Sewage Irrigation at Gennevilliers, which appeared in Vol. XII. of the Second Series of the Journal.

Amongst other distinguished Members whose loss the Society has had recently to deplore are the following:—

Viscount Templetown (died January 4, 1890). Lord Templetown had been a member of the Society for forty-two years, having been elected in February 1847. He was a representative peer for Ireland, and was Lieutenant-Governor of Portsmouth, with the command of the Southern District, from 1870 until his retirement from the army in 1877.

Mr. C. R. M. Talbot, M.P. (died January 17, 1890). Mr. Talbot, the "Father of the House of Commons," who had sat for the county of Glamorgan, or a division thereof, continuously since 1830, was one of the oldest members of the Society, having been elected on August 7, 1844.

Earl Sydney (died February 14, 1890) had been a member of the Society since June 29, 1840.

Lord Dacre (died February 27, 1890), who is succeeded in the oldest barony of England by another member of the Society—Viscount Hampden—became a subscriber to this Society in May, 1840, and a Governor in 1875.

Lord Auckland (died February 27, 1890) had been a member since 1862, and quite recently had taken an active part in connection with the invitation from Doncaster for the Society's Country Meeting of 1891.

The Duke of Manchester (died March 21, 1890), had been a subscriber to the Society since April 1856, and a Life Governor since March 1875.

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OF ENGLAND.

THE DEVELOPMENT OF AGRICULTURAL
MACHINERY.

THE doctrine of evolution, with its now admitted application to every subject of human inquiry, would compel a writer, even upon farm machinery, to throw at least a glance backward towards the origin of the implements whose story he wished to tell, just as the biologist concerned with the life-history of any given group of organisms, living or fossil, must say something of its development, under penalty of having, otherwise, brought too little of the "dry light" of science properly to illuminate his subject. The "enchainment of things," as George Eliot happily called the indissoluble nexus between acts and their consequences, connects the past and present of reaping and threshing machines by links of similar character to those which bind together the seemingly scattered deeds of man, and heredity dominates equally the humblest human works and most complex human ways.

Viewed from this standpoint, the Royal Agricultural Society of England may, itself, be considered as a product of evolution, born of that desire for associated action whose very existence differentiates this century so strongly from the last, and which, within fifty years, has become undisputed king of the whole realm of material progress. Long, however, before men began thus to crystallise around societies, and seek in them new

springs of action, there existed in this country a number of mechanicians who were engaged in making ploughs, harrows, and other simple agricultural tools. For them, the rise of the Royal Agricultural Society of England constituted a profound change of "environment," and it is interesting, not only to observe the early ploughwright coming first under the influence of the Society's Shows, but to note the modification of that influence itself which resulted from the reaction of the craftsman upon the Society.

The implements shown at the Society's first meeting at Oxford in 1839 were, for the most part, "crude, cumbrous, and ill-executed machines, the work of village ploughwrights and hedge-side carpenters" (Parkes, Liverpool Report, 1841): men who followed the rule of thumb, knowing nothing of the rule of three, isolated from their fellow-craftsmen, and so dependent each on his own initiative, that Kent hardly knew how to turn a furrow with a plough of Suffolk make. Such as these pioneers were, however, —twenty-three in number, and including among them Ransome, Garrett, and Howard—they picked each other's brains for the first time in 1839, and to such good purpose that, three years afterwards, the Society's engineer reported as follows:—"The manufacture, even of the commoner implements, has already, to a great extent, passed out of the hands of the village ploughwright and hedge-side carpenter, and become transferred to makers possessed of great intelligence, skill, and capital, while examples are not wanting in the higher classes of machinery to show that the fourth important object for which the Society was incorporated is to some extent fulfilled—viz. to encourage men of science in their attention to the improvement of agricultural machinery" (Parkes, Liverpool Report, 1841). Year by year, as Show followed Show, this sharpening of man's face by man's face went on, Mr. Parkes being able to speak, as early as 1841, of a "vast stride" already taken in the mechanics of agriculture, a stride which he attributed to the yearly "congregating together of agriculturists and mechanicians from all parts of the Empire."

The Prize System, it is true, existed from the first, but its influence upon improvements was, at that time, insignificant. Only five pounds, one gold and three silver medals were awarded to implements at Oxford in 1839, the whole being equal in value to one and a half per cent. of the money then given away! No money, and only seven medals, were awarded to implements at Cambridge in 1840, and trials were, as yet, unknown. A rough dynamometer was, indeed, applied to ploughs, and only to ploughs, in 1841 and in subsequent years,

but it was not until 1848 that any "trials" of implements, properly so called, were instituted. It was not from decisions based upon mere inspection of their implements that the "pioneers" learnt anything; they were stimulated, not by the Prize System, which was then an "infant, muling and puking in its nurse's arms," but by contact with rivals and access to purchasers, advantages hitherto denied them, and which were all the more valuable in the almost entire absence at that time of railway communication.

The much-debated "Prize System" must necessarily be discussed in this paper, because it forms the most important factor in the new "environment" with which the Society has been considered as surrounding the implement maker; but a certain distinction must be introduced at the threshold of the inquiry. It is not, here, proposed to ask what the Prize System has done for the Show, but what has it done for the improvement of agricultural machines? So far as entries of implements are concerned, the Shows advanced by "leaps and bounds" between 1839 and 1847, a period during which there were no "trials," properly so called; but implement entries remained stationary between 1848 and 1855—years during which extraordinary efforts were made by the Society to apply scientific tests, *annually*, to every class of implement shown in the yard. Measured by entries of implements, the Prize System, crude as it was during the first ten years of the Society's existence, must be considered as a magnificent success, but the true value of its later and scientific development cannot be ascertained from any statistics. This must be sought, first, in an intimate knowledge of the changes in practice which followed upon the introduction of tests; and secondly, in the attitude which makers themselves assumed towards these tests as soon as they became scientific in character.

No clearer head and no cleverer pen have ever considered and recorded the mechanical lessons of the Royal Agricultural Society of England's show-yard than those of the late Sir H. S. Thompson. Gifted with the rare power of grasping details while remaining interested chiefly in essentials, this gentleman's, too few, reports are beacon-lights which shed a steady lustre over the turbid waves of multitudinous mechanical details in which so many strong swimmers have foundered while trying to do justice to their theme. He says (Norwich Report, 1849):—"The Society's early shows of implements must be viewed chiefly in the light of bazaars. Those who attended the Cambridge Meeting in 1840 will not have forgotten the brilliant collection of implements exhibited by the Messrs. Ransome;

but, though every one praised the excellence of their workmanship and admired the skill with which eighty different kinds of ploughs were grouped, tier above tier, with artistic effect, still it was evident that this imposing array was not prepared in anticipation of such a searching ordeal as that to which candidates for prizes are now subjected, but was rather intended to tell visitors what sort of implements they ought to buy, and show them to what perfection this branch of manufacture had been brought. Nor could it have been otherwise, for the knowledge of these matters possessed by a few of the leading manufacturers was altogether in advance of the general agriculture of the day. Neither Stewards nor Judges had yet acquired the experience requisite for the adequate discharge of their office, so that such men as Messrs. Garrett, Hornsby, Ransome, and a few others, would have laughed in their sleeves had they been told they could learn anything in the Society's show-yard. In spite, however, of a creditable display on the part of a few leading firms, the majority of the implements exhibited at the early Shows were of inferior construction and workmanship, and the general appearance of the exhibitions meagre and unsatisfactory."

But a few members of the Society, among whom the late Mr. Handley deserves special mention, soon saw that nothing was gained for scientific agriculture by collecting implements in a show-yard, unless *adequate* trial could be made of their respective merits. It was not, however, until after the appearance of Mr. C. E. Amos as Consulting Engineer to the Society in 1848 that any important changes were made in the system of trials. There had been great ploughing-matches in all previous years, which, being open to the public, gratified sightseers, but, giving no results that could be depended upon, disappointed all practical men. A number of Judges perambulated the yard, inspected the machines, and reported, in a more or less perfunctory way, to the engineer, who, after correcting some of the cruder conclusions thus arrived at, forwarded his own, and these various reports, to the Council.

Such a state of things could not long continue in a Society numbering many men like Mr. Handley among its members. Four years only had elapsed from its first founding, when Judges withheld prizes (at Derby in 1843), alleging, as a reason for so doing, that the machinery upon which they were asked to adjudicate ought to be subjected to "lengthened and accurate trial," and suggesting, first, that the public should be excluded from the trial fields, and secondly, that a proper catalogue of such implements as were to be tried should be prepared beforehand.

The lightning-flash of 1843 was followed by a growl of angry thunder in 1844. The public were restrained, for the first time, at Southampton, from entering the fields where science proposed to conduct its examinations, and great was the satisfaction of the Judges. But when, in the absence of a confusing crowd, seeds were seriously dropped, handles reflectively turned, steam thoughtfully applied, and horse-walks circumspectly considered—behold a portent! Many of the drills were found to be gaily painted shams, the chaff-cutters choked, steam-engines were condemned as “toys,” and horse-gears declared to be no better than they should be. At the first touch of science, perfunctoriness collapsed, and there arose a bitter cry for reform.

The year 1845 witnessed further “struggles toward the light,” and produced new suggestions from Judges—first, for deferred trials in the case of machines not properly capable of trial in summer; and secondly, that the indiscriminate exhibition of duplicate machines should be prohibited. The whole show of implements at Shrewsbury (1845) was spoken of as “much below par,” and the reader of these early reports becomes painfully aware that everybody was dissatisfied with everything; that both implements and trials needed radical improvement.

Meanwhile, the Society's prize list remaining restricted to the simpler field implements, a crowd of new inventions, which, however begotten, were certainly not the children of such trials as had hitherto taken place, presented themselves for notice, and clamoured for money prizes and medals. The portable steam-engine, first introduced in a crude rotary form (1841), had grown in numbers with every succeeding Show. The haymaker had put in its claims (1843) to be considered as a practical tool. The first “combined” threshing-machine, and the first straw-shaker shown at the Royal Agricultural Show, had appeared in 1843 and 1845 respectively. The drill had grown, even in the absence of scientific trials, almost to maturity, and was being seriously challenged by that child-of-a-day, the “Dibbler.” Carts had been furnished with springs (1843), “Turnwrest” ploughs of excellent design (Lowcock 1845) had come to the birth. Drain-tile machines and the operation of draining were exercising men's minds. Even a steam digger, the invention of a lady, had been shown in 1842, while, as yet, all men and all things awaited the avatar of a good system of trials.

The hour and the men came at length. Mr. Amos, now Engineer to the Society, had already given much attention to the question of dynamometrical tests, when he found himself supported, at York in 1848, by the brain and the pen of Mr.

H. S. Thompson. Norwich (1849) followed, and Mr. Thompson again, fortunately, reported; then the tide turned. In the Report of the York Show (1848) this excellent critic and admirable writer recorded his conviction that the trials to which implements were subjected at York were, on the whole, more decisive of merit than at any former Show, which he partly attributes to the regulations adopted by the Council establishing a fixed proportion between the length of the crank and the number of revolutions per minute in all hand machinery, and also to the use of a machine for testing the working power of steam-engines and the draught of threshing-machines, chaff-cutters, &c. "The use of this instrument, and the enforcement of the regulations alluded to, have both assisted in *placing the machines under trial in precisely similar conditions*, and consequently rendering the decision of the Judges more conclusive."

From Derby (1843) downwards the "increasing extent and importance of the exhibitions of implements were beginning to be felt, but, as yet, there was such a want of system, especially in the trial of those machines which took place out of the show-yard, that the public, the exhibitors, and even the Judges, were at a loss to know where to go or what was expected from them." No one was to blame for all this confusion, for the greatest anxiety was shown to carry out the objects of the Society, but it "arose from the rapid development of this department of the Show, which far exceeded any anticipations that had been formed respecting it, and thus, year after year, rendered inefficient all previous arrangements" (H. S. Thompson, York Report, 1848).

Weighing and measuring, the bases of all science, had, however, come to the aid of agriculture at last, and it remained to be seen how the, hitherto, belated Judges of the Royal Agricultural Society of England would exploit their new allies. The eight years immediately following upon 1847, when first the despot "Dynamometer" took sceptre in hand, record the efforts of Titans. Nothing less than a yearly test of every machine, great and small, would satisfy the newly and terribly equipped Judges. When one bears in mind that during those awful years 1848-55 (after which the rack and thumb-screw were slackened) the average number of machines exhibited annually was about 1,500, and that (saving duplicates) *all* had to go under the yoke, astonishment is lost in admiration of the men who bore the heat and burden of such a day. But, having taken up their cross in the shape of the "power-resister," they followed it like heroes, with the usual result of heroism. Tumultuous, hurried, and insufficient as were many

of the trials of this pregnant period, they had an extraordinary effect. Based, at least, upon scientific method, they made implement makers "sit up" in a way that was entirely new to them. No man, now, laughed in his sleeve at the idea of "learning anything in the Society's show-yard," but all were told in turn that which they could not learn at home, but which it was life or death to know, not only when they were beaten, but why they were beaten. There was little or no revulsion from the new methods by makers, certainly none by the best makers, who, as the writer well remembers, became eager for the Society's Report, and the Society's comparative figures of draught or duty, since they could look nowhere else for such aids to practice.

Why dwell on the history of such field and other trials as took place between the York Meeting in 1848 and that at Chelmsford in 1856? It was a time of fevered action which only those who saw can realise. Scores of crude, or promising, ideas came, year by year, to the test of "weighing and measuring." As the methods of trials grew more refined and accurate, the slaughter of the innocents became terrible: but the survival of the fittest was assured, and neither gaudy paint nor plausible tongues could, now, induce intelligent farmers to buy anything until they knew what the dynamometer had to say to the salesman. Thus, by a double process, which aided the thoughtful mechanic while it crushed the charlatan, did the new agent exercise a Spartan but beneficent influence throughout the whole field of agricultural mechanics.

Are proofs needful? Let the steam-engine reply for other classes of machinery. The case is one wherein the results of the Society's trials are measurable in pounds of coal and water, the equivalents of £ s. d., and one, too, in which the shape of the organism, so to speak, exhibits plasticity under the influence of *conditioned* trials just as an animal does in the skilful breeder's hands. Did the Society ask for economy of coal? The prize engine of 1849 burned $11\frac{1}{2}$ lb. of coal per horsepower per hour; that of 1850, $7\frac{1}{2}$ lb.; of 1852, $4\frac{1}{2}$ lb.; of 1853, $4\frac{1}{2}$ lb.; of 1855, $3\frac{1}{2}$ lb.; of 1856, $3\frac{1}{2}$ lb.; of 1872, $2\frac{1}{2}$ lb.; and of 1887, $1\frac{1}{2}$ lb. per hour! Did the Society say,—You shall not overcrowd your boilers with tubes, impairing the durability of the tube-plate for the sake of diminishing consumption. There followed an ample film of wrought-iron between tube and tube, while the consumption diminished. Did the Society say,—You have made your boilers too big, and your engines, consequently, too heavy in the heedless pursuit of economy. Straightway the weight of the prize engines dimin-

ished. Did they say,—Your expansion gears are too complicated for use by farm-engineers. The second valve disappeared, and still the consumption of coal remained economical. Did they say,—There shall be no more "Racers." The engine of commerce stood ready to accomplish all that the "Racer" had done. Did they, finally, say,—We impose no further conditions; show us now what can be done by compounding. Newcastle answered by more than one engine which, although of trifling horse-power and non-condensing type, equalled in economy of fuel anything that has hitherto been accomplished by the largest and most economical condensing engines in existence.

That which is true of steam-engines is true of other implements. To admit that the former may be considered as the children of conditioned trials, while other machines which have come under the influence of the Society's tests are of independent development, is mere trifling. It is as if a man should say, "Chemistry is the child of the balance, and physiology of the scalpel; but commercial success may be ensured without a balance-sheet, a wholesome house without a spring clean." Many trials were, no doubt, inadequate, and some verdicts were fallible; but the question is not "Do judges never make a mistake?" but "Are they not right in a large majority of instances?" Opponents of the Prize System "fix their attention too exclusively on defects and shortcomings from which no system is free, and thus lose sight of the sterling advantages which belong to it, and which have been so long enjoyed that they are taken as a matter of course." (H. S. Thompson, *Journal*, 1864.)

The defects and shortcomings in question, due for the most part to haste, coupled with the fearful strain which an annual trial of every class of implement entailed alike upon makers and Judges, brought about a change in 1856. Triennial trials were first introduced at Chelmsford in that year, and these subsequently became, first quadrennial in 1859, then nonennial in 1873, and lastly, non-periodic, as they remain to-day. The period subsequent to Chelmsford has been characterised by a constantly increasing refinement in the character of the tests themselves, and by the diminution of haste in their application. Taking the last trials of steam-engines (Newcastle, 1887) as an example, it is scarcely too much to say that it was the completeness of the tests then applied which enabled the engineers to compile probably the most useful and accurate Dr. and Cr. account which has ever yet been struck between thermal energy and mechanical effort. The hay-pressing trials at Nottingham

(1888) may be similarly characterised. Six long summer days were given to investigations concerning a single type of machine, with the effect of clearing up a perfect chaos of constructive principles, and putting makers, attempting in this case a new road, definitely in the right path.

There is something, of course, to be said on the other side of the question. Sir H. S. Thompson, with the frankness of true ability, admits, in more than one passage of his writings, the difficulty of *proving* exactly how far improvement depends upon tests; and if the steam-engine has been spoken of above as plastic in the hands of a Society dictating the conditions of its trials, it must be remembered that much had been done in steam between 1872 and 1888—years during which there were no engine trials—for which the Society can, of course, claim no credit. Similarly, the period between Plymouth (1865) and Manchester (1869) was void of Reaper trials, yet saw the introduction of the “controllable rake”; while the sheaf-binding reaper was introduced and had become a practical success in America during years also void of Reaper trials in England (1870–1876). Both these inventions were of American origin, and, provably, children of no other parents than Supply and Demand. They, however, with other examples that could be mentioned, tending to support the doctrine that trials are vain, may be freely yielded by the advocates of tests, in view of the fact that the sheaf-binder certainly was made useful to English farmers only through the modifying influence of the Society’s repeated trials.

It would be strange if the action, searching as it was, of the Royal Agricultural Society of England upon the craftsman, and the reaction of the latter upon the Society itself, had been always unaccompanied by friction. Such differences of opinion as have, rarely, occurred between the two have, however, been only *amantium ira*, so soon, and so happily, composed as not to call for record, saving for a certain light thus thrown on the importance which the Society has always attached to recommendations of implement-makers. Eight years of dynamometrical trials (1848–1855) had already not only separated the goats from the sheep in the implement-yard, but graded makers pretty accurately, in spite of hurry and of errors. The burden of annual trials in all classes of implements was terrible. Well might makers declare that they could not be always scheming and at the same time give that attention to their business which its rapidly growing importance required. Well might implement judges and engineers feel overdone by labours for which no adequate time was given. Meanwhile, the great

makers were well satisfied with the positions they had attained at, or near, the "top of the tree," whence they were feverishly anxious neither to be dislodged by obscure talent, nor (which they feared much more) relegated "nowhere" by running second in a neck-to-neck race with some already important and dreaded competitor. Hence, at the instance of makers, arose the introduction of triennial trials, already alluded to, which gave breathing-time alike to jaded inventors and hurried Examiners.

The three years' course jogged comfortably along from 1856 to 1860, when the fatted calves of the implement-yard revolted, under a flag of rather vague design, against the then administration of the Prize System. Most of the great makers absented themselves from the Canterbury Show in 1860, but returned to their tents at Leeds in 1861, after which date trials became, for a time, quadrennial. Neglecting a tiny *émeute* which occurred at Taunton in 1875, no further secession, either from trials or show-ground, took place until steam-engines were tried at Newcastle in 1887, when, as every one remembers, all the "great" engine-makers abstained from competition, although making their usual exhibition in the yard. Such are the "lovers' quarrels" that have occurred between the Society and makers, and it is no slight testimonial to the Prize System that such a possible *causa teterrima belli* should have done so little mischief.

It is an interesting fact that certain periods in the history of the Society are marked each by special solicitude for some particular agricultural implement or operation, a solicitude which has often risen to intense and, sometimes, prolonged excitement. If mechanical ideas are born from some happy union of Science and Practice, it is none the less true that their development depends very largely on nursing. The Society has, certainly, never procured the origination of any implement, for the germs of nearly all the agricultural machines of to-day existed before it came into being, and its functions, if for no other reason, have been limited to the nurture of inventions. But to fasten now upon one, now upon another, pregnant idea and to "worry" it, so to speak, until it has yielded all the wealth that can be wrung from it, is a very important function indeed, and, from this point of view, the Society may be almost said to have "invented" certain important agricultural machines. A few words may not be thrown away in describing some of the more important "storm-centres" around which successive hurricanes of interest have, at various times, gyrated.

Mr. Pusey's epoch-making paper upon the "Condition of Agriculture in England in 1839," speaks of the plough, the

harrow, the threshing-machine, and the turnip-cutter as the only implements then in common use, and goes on to say,—“The use of the drill-machine, by which seed is laid in regular rows, has lately become frequent in southern as well as in northern England, although it has established itself so slowly that, for a long time, travelling machines of this kind have made yearly journeys from Suffolk as far as Oxfordshire for the use of those distant farmers by whom their services are required.” Incredible as it sounds to modern ears, the drill was an implement whose very function had to be explained to southern farmers fifty years ago. It was a travelling mechanical curiosity!

This was the first machine around which the interest of the Society “swarmed,” so to speak, and that without intention. It had offered its earliest prizes to gorse-crushers (!), apparently dreaming that the road to agricultural salvation lay over the furzy downs of half-cultivated counties, when the drill came and took its sympathies by storm. Between 1839 and 1846, when Mr. Parkes speaks of the implement as “perfected,” the drill simply “corralled” the agricultural world and the Society’s members. Only four years after Mr. Pusey had told southern farmers what a drill was like, sixty-one of these machines were shown at Derby (1843), and most of the great reputations as drill-makers had been established. “The contemplation of such a display cannot but have been gratifying to the members of the Society, including as it did an adaptation of the drill to almost every species of seed and seed-crop, and justifying the encouragement extended by the Society to this pre-eminently important division of the agricultural art.” (Parkes, Derby Report, 1843.)

There followed upon the passion for drills an enthusiasm for draining and drainage implements, the years 1844–48 being remarkable for great activity in this department. Nothing “less than a volume would suffice to satisfy the public appetite for knowledge on this subject,” said Mr. Parkes in 1845; and the Society’s interest in drainage at this time is illustrated by repeated offers of large prizes to tile and pipe-making machines.

“It was somewhere about 1843,” says Mr. Albert Pell, in some diverting reminiscences of the Society’s earlier Shows with which he has favoured the writer, “that the late Mr. Read, of Piccadilly, an enthusiast on drainage, and an able inventor, told me he had a friend in the New Road, a plumber, who made lead pipes by pressure through a die, and it was Mr. Read’s opinion that the method might be adapted to the making of clay pipes. Shortly after this, the rumour ran through my

locality that the problem had been solved, and that pipes had been made without a wheel, which stood the kiln as unconcernedly as did Shadrach, Meshach, and Abednego; but no one could point out on the map the exact spot where this wonder was worked. Strolling one day, however, down a little-used drove-way on the northern slope of the Chiltern Hills, in Bedfordshire, I beheld a square wooden tower, about the size of Punch and Judy, approaching me, propelled by a pair of dirty 'high-lows,' belonging to some one inside the box. 'Codlin' might be within, but 'Short' and the drum were absent; moreover, the tower was draped with dirty canvas and appeared more burdensome than the 'Thespian' property; so that I soon became satisfied it was some other concern. 'Hallo!' I cried, 'what's this?' when a gruff voice promptly replied, 'What's that to you?' whereupon I went off, unenlightened and discouraged. That evening, however, I found the village deeply moved by the intelligence that, in a brick-yard, three miles distant, a lot of drain-pipes might be seen, 'round 'uns, like poipes, as a chap had made in a box all by his self. He wouldn't let no one see the box, and he'd gone off as soon as he'd got his money.' I saw the 'poipes' next day, and, within a month, had seen the wonderful box and made another like it. Needless to say, this was a pipe-die machine of the simplest possible construction, but with this apparatus I made 13,000 pipes with my own hands, the first drain-pipes, as I believe, ever made in Cambridgeshire."

The portable steam-engine and threshing-machine began to attract abnormal attention about 1847. In 1842 Judges had, indeed, expressed serious doubts whether steam could ever be successfully applied to the driving of barn works, and, as yet, no one dreamed of out-of-door threshing. But, in 1847, seven engines and threshing-machines were set to work in the Society's yard. No tests were applied, and the proceedings evidently became alarming to all concerned; the machines, in the Judges' opinion, being driven at much too high a speed, and one of them being smashed to atoms. But in the following year (1848) Mr. Amos and Mr. Thompson, with the newly-born dynamometer in their hands, put no less than ten engines and threshing-machines through their paces, only to prove, in 1849, that three-fourths of the power absorbed by the best barn-works were expended in driving the machinery, while only one-fourth of such power was utilised for the work of threshing. Henceforward, and for some years (or, say, from 1847 to 1851), a thrilling interest centred around the whole question of steam-threshing, which only abated with the comparative perfecting

of the "Combined Machine," and the firm establishment of rick-side steam-threshing as common practice.

Mr. Pell, describing threshing in the days when there were no movable steam-engines, says:—"One saw four, or even six, splendid mares, up to their hocks in straw, as fat and sleek as moles, going round and round in the meekest way, with a very small boy and over-balancing whip revolving on a little stage in the centre of the circle, whose duty it was to flick their backs in turn, and to keep up a perpetual litany of 'Now then, Smiler!' 'Get along, Beauty!' 'What are you at, Diamond!' 'Gee-hup, Blackbird!' 'Darn you, Charley!' 'Whoy-hoop, Smiler!' But in the dark evenings when Smiler and Beauty and Charley were hunting each other round the cribs in the horse-yard, the rattle of the threshing-machine might be heard in the great barn and the gleam of candle-light be seen through the cracks of the door. Inside is a tread-wheel geared to the drum. Six or eight 'honest' men toil up it, a relay of the same number are sitting on the straw or on corn-bags. The master's great silver watch hangs on a nail under the candle to regulate the shifts, and heavy men are at a premium. Thus they threshed the large fen and open-field crops; this now obsolete method, the practice of something much under a century, having succeeded to the previously unchanged and simpler practice of the ages."

The first appearance of Fowler's draining-plough, in 1850, raised a new excitement, which, growing with the rapid development of this implement into the steam-plough, culminated in a fever of interest in the great question of steam-cultivation, a question which was threshed out in the most thorough and determined manner by the Society, whether by trials or by original investigation, during the twenty years following upon the appearance of Fowler's pregnant "Mole" at Exeter.

Another interest, second only in keenness to that created by steam-tillage, accompanied the latter from 1851, and outlasted it by several years, being, indeed, scarcely yet exhausted. Mr. Pusey's description and trial of McCormick's Reaper in 1851 gave a stimulus to curiosity, but raised no enthusiasm on the subject of mechanical harvesting. The Society, however, duly experimented with every new Reaper appearing between that date and 1862, when a practical form of automatic sheaf delivery first made its appearance. Then the agricultural world "caught on" to, and has never since ceased to interest itself in, the improvement of reaping-machines. Excitement upon this subject, within the four corners of the Society's domain, began with the Manchester trials of 1869, and cul-

minated with the introduction of the sheaf-binder and its repeated trials at Birmingham, Liverpool, Bristol, Derby, and Shrewsbury, between 1876 and 1884.

Such milder excitement as has been aroused by dairying, in later years, remains a feature of the present day, but the great storms of interest which were created by the action of the Society upon the introduction of drilling, steam-threshing, steam-ploughing, and machine-reaping, have passed away for ever. Battles rather than storms were those Berserker struggles which have raged successively around the subjects in question during the fifty years of the Society's life. Who shall describe the shock with which the heroes met in the field, by the barn, or among the stubble? Who shall count the slain in discarded machinery, and, it is to be feared, a few ruined men? Who shall appraise the spoils of the victors or, most important of all, measure the benefits which have resulted to agriculture?

It is not possible to pass away from the consideration of these men's works without wishing for at least a glance at the workers, and, especially, to recall some traits of the earlier artificers who lent the attraction of strong personality to the show-yard in days before this, together with its exhibitors, had become stereotyped, as they are to-day.

All the world knows the modern implement-maker, whether, turning over half a million sterling per annum, he pays talent handsomely, employs hands by the thousand, writes M.P. or C.C. after his name, and both goes and fares sumptuously every day; or whether he struggles in a small and stupid way with

"the perils that environ
The man that meddleth with cold iron."

But who, now, remembers Mr. Richard Garrett, of Leiston, in the hat which Mr. Albert Pell has immortalised? "About this time (1843) the two wonders of the Show, to my youthful mind, were the hats of Mr. Richard Garrett, of Leiston, and Mr. George Turner, of Barton. They have never been equalled. Something of the kind was attempted by my friend the late Lord Berners, and there is even now a well-known hat from near Aylesbury that graces our shows and affects the antique, but it is far behind the great originals, which literally awed me. I used to surmise what chance a skull under an ordinary beaver had against such commanding head-gear." Who, now, conceives how implement-maker and customer, Mr. Garrett and Mr. Pell, did their business in those days? "He came to Ely, on horseback, assisted by his hat, if the wind was favourable. We and

others dined together and discussed implements—and splendidly constructed implements his were. I have bits of them of that date in use now. Having given our orders, he forwarded them, either by his own or hackney horses, from Leiston to Soham, near Newmarket. There our cattle met them, and drew the wondrous inventions to our reedy homesteads.” Who is not interested to know that among the competitors in the Liverpool ploughing match (1841) was a Bedfordshire lad, not yet twenty years of age, who brought an iron plough, constructed at his father’s works from his own design, and that it was an object of much curiosity? This was no other than the late James Howard, who, finding no one to whom he was inclined to entrust the implement, took off his coat and guided it himself, his practice at the Priory Farm, Bedford, having made him so expert that he secured for this “patent Scotch two-wheeled plough” one of the eleven prizes awarded for this description of implement. Or how Mr. Pell himself fell in, for the first time, with Mr. Howard and his famous harrows at the Southampton Show in 1844: “I have a remembrance of a fresh-coloured young man meeting me as I drew near these zigzag tormentors of the soil, and pointing out their charms with such insinuating effect that I became their purchaser on the spot. This is how we got the harrows from the Royal Show-yard to Ely in Cambridgeshire—first by rail to Nine Elms, next to an inn in the Old Bailey, the terminus of a carrier’s cart which got them on to Cambridge, whence another of Hobson’s calling transferred them to Ely. They arrived in time for the autumn wheat-seeding!”

How welcome are even these scanty sketches of one or two of the “Pioneers”! Would that Mr. Pell’s memory and humour could present the readers of the *Journal* with many similar portraits!

The question finally arises, What, after all, have these inventors, improvers, and their solicitous nurses, done for the agriculturist? All the agricultural world knows that Mr. C. S. Read has replied to this inquiry by an emphatic “Nothing!” But the same gentleman has said the same thing of all science, whether chemical, physiological, or mechanical, in its application to agriculture; and much will be forgiven to a paradox-loving nature, capable, like his, of affording the keenest enjoyment to an audience while science is wittily minimised during a delightful hour, and even practice itself treated as “a poor thing, my lord, but mine own.”

If, however, *pace* Mr. Read, one question can answer another,

it may well be asked, Who buys up the implement section of the show-yard annually, with its six thousand machines, representing some 20,000*l.* of value, the whole being but a small fraction of the implement-makers' yearly production of machinery—and why?¹ “No common motive can have induced men of solid character and fixed habits suddenly [this was written of steam in 1864] to buy thousands of costly machines whose construction they don't understand, and whose adoption forces them to change many of their former plans and renders useless much of their former expenditure. The cause is competition. The British corn-grower is competing with the corn-growers of all nations. The whole world is running a race to secure the best market for its productions, and the repute of our wealth and universality of our commerce are year by year turning the current more and more towards our shores. The increased area from which supplies are now drawn to the British market, and the diminished cost of transport, have so lowered the average price of grain as to make it necessary for the English farmer to reduce his outgoings in order still to grow corn at a profit. These outgoings consist principally of rent, wages, and expenses. Has he any prospect of a reduction of rent? Is it not notorious that the competition for farms is such that the tendency is toward a rise rather than a fall in rents? Can wages be lowered? It is equally notorious that wages have increased considerably during the last ten years, and that they still tend to rise. The only available expedient then appears to be to reduce the cost of cultivation; hence the unusual expenditure now being incurred for the purchase of machinery; so that this outlay, though apparently rash and hazardous, is really a work of necessity, *an indispensable condition of the British corn-grower holding his own.*” (H. S. Thompson, *Journal* 1864.)

All which, true as it is, furnishes no figures to the credit side of the farmer's account against implements, and, indeed, these are very difficult to procure, the question of his advantage by their use being too complex for settlement by a mere comparison of wages, such, for example, as might be made between the cost of threshing by the flail and by the machine, of hay-tossing by hand or by the tedder, or of reaping by the hook and the harvester. Time is so important a factor in all these

¹ Some few years back the writer attempted to collect from implement-makers statistics which would show the total value of agricultural implements manufactured annually in this country. Some firms responded to his questions, but many refrained, and nothing definite was consequently obtained; but enough was gathered to place it beyond doubt that the value in question considerably exceeds 3,000,000*l.*, the larger but unascertainable portion of the machines representing this sum being exported.

cases as to set figures at defiance and turn every so-called calculation into an estimate. Still the mind craves for some demonstration of the economic value of implements stated in terms of cash, and buttressing such presumptions as arise from the question "Who buys all the implements, and why?"

Mr. J. Evelyn Denison, M.P., attempted such an answer in a report to the British Government upon the agricultural section of the Paris Exhibition which was printed in the *Journal* (Vol. XVII. 1st Series, p. 33). He says that since it may be thought by some that too much stress has been laid on their value, it might be worth while to examine the point more closely; and he therefore proceeds to show the saving that might be effected on a farm of 200 acres of arable land (at a rental of 25s. per acre), drained and laid into fields of a suitable size by the use of good implements. "All land," he says, "is ploughed at least twice a year. The difference in labour between ploughing drained or undrained land is very great. It would be an estimate much below the mark to put it at 1s. per acre for each ploughing—for the year 2s. per acre.

"The next process would be sowing the seed. On the old system $2\frac{1}{2}$ bushels of seed-wheat would be sown broadcast per acre. On the new system, with an improved drill, $1\frac{1}{2}$ bushel would be sown, with better results. There would be a saving, therefore, of 1 bushel per acre on the 50 acres sown with wheat, which, at 7s. per bushel, amounts to 7l. 10s., or per acre over the whole area 1s. 9d. On 50 acres of barley there would likewise be a saving of 1 bushel of seed per acre, which, at 4s. per bushel, would give a saving per acre of 1s.

"Next comes the preparation of the grain for the market. There are to be threshed the produce of 50 acres of wheat, at a yield of 4 quarters only per acre—200 quarters; of barley, 50 acres, at a yield of 5 quarters per acre—250 quarters. The cost of threshing wheat by the flail, and dressing, is 4s. per quarter; by an improved steam machine, 1s. 6d.; saving on 200 quarters of wheat 25l., or per acre 2s. 6d. The cost of threshing barley by the flail is 3s. per quarter; by steam machine 2s., saving on 250 quarters 12l. 10s., or per acre 1s. 3d.

"Total saving by the use of drill and threshing-machine, 8s. 6d. per acre, or one-third of the rent, 25s."

It will be observed that the saving effected by the reaping-machine is excluded from this estimate, which might, otherwise, be correctly stated as half, instead of one-third the rent.

Mr. Philip Pusey made a pronouncement on this question in the extremely able and comprehensive Report upon Implements

which he furnished to the Prince Consort at the close of the Great Exhibition in 1851 (Journal, Vol. XII. p. 587). He says: "It seems proved that, within the last twelve years, since annual country shows of implements were established by Lord Spencer, Mr. Handley, and others yet living, old implements have been improved, and new ones devised, whose performances stand the necessary inquiry as to the amount of saving they can effect. To ascertain that amount precisely is difficult, but, looking through the successive stages of management, and seeing that the owner of a stock-farm is enabled in the preparation of his land, by using lighter ploughs, to cast off one horse in three, and by adopting other simple tools to dispense altogether with a great part of his ploughing; that, in the culture of crops by the various drills, horse labour can be partly reduced, the seed otherwise wasted partly saved, or the use of manures greatly economised, while the horse-hoe replaces the hoe at one-half the expense; that, at harvest, the American reaper can effect thirty men's work, while the Scotch cart replaces the old English waggon with exactly half the number of horses; that, in preparing corn for man's food, the steam threshing-machine saves two-thirds of our former expense; and, in preparing food for stock, the turnip-cutter, at an outlay of 1s., adds 8s. a head in one winter to the value of the sheep; lastly, that in the indispensable but costly operation of draining, the materials have been reduced from 80s. to 15s.—to one-fifth, namely, of their former cost—it seems to be proved that the efforts of agricultural mechanists have been so far successful as, in all these main branches of farming labour, taken together, to effect a saving, on outgoings, of little less than one-half."

The question of the value of implements to agriculture, considered in the broadest way—viz. by contrasting present conditions with those which prevailed when every agricultural operation was conducted solely by manual labour, as it is, for example, in many parts of the far East to-day—may be attacked, quite speculatively, it is true, but not, perhaps, unprofitably, in the following way.

Mr. J. C. Morton's interesting paper on the "Forces Employed in Agriculture," read before the Society of Arts in 1857, demonstrates, among other things, that, for ordinary farm purposes, a single horse develops the same mechanical effect as thirty-two men, while each unit of steam horse-power equals the efforts of sixty-six men. Now there are, roughly speaking, a million of agricultural labourers employed on the land in England, and the wages of these persons amount to 26,000,000*l.*

per annum. They are assisted by 800,000 horses working on an average 2,500 hours per annum, or by, say, 250,000 horses working all the year round. Since, when at work, each horse represents the equivalent in mechanical effort of thirty-two men, thirty-two times 250,000, or say eight millions, of additional labourers would be required to replace the 800,000 horses employed by agriculture, if the same amount of cropping now produced in the country were to be raised by entirely unassisted manual labour. These eight millions of labourers would require 200,000,000*l.* wages, while the 800,000 horses they would displace may be considered as costing in food, attendance, and general expenses 50*l.* each per annum, or 40,000,000*l.* a year. In other words, the use of horses and implements in the agriculture of England represents an economy of 160,000,000*l.* per annum, as compared with what would be the cost of cultivation solely by hand. It is further probable that the total agricultural steam-power now existing in England is not less than half the horse-power of the country, or say 400,000 horse-power; and if it be presumed that this, like the horse-power, is only active for a third or fourth of the year, there remains, say, 120,000 horse-power, which, if replaced by men at the rate of sixty-six men per horse-power, would saddle existing agricultural production with a further eight millions of men, costing another 200,000,000*l.* in wages. From this amount there would be only a small deduction for engine attendants, who, allowing one man to every ten horse-power, would cost little more than 350,000*l.* per annum. These estimates are mere speculations, and are diffidently offered only for what they are worth, but they probably indicate the *character* of the changes in agricultural economics which have followed upon the application of the mechanic's art to the cultivation of the soil.

DAN. PIDGEON.

THE AGRICULTURAL LESSONS OF "THE EIGHTIES."

EIGHTEEN HUNDRED AND EIGHTY was launched into existence at a period of intense agricultural and commercial gloom. I shall not readily forget the feeling of thankfulness with which I regarded twelve o'clock at night on December 31, 1879. At any rate, a doleful, ruinous year had departed. There might be no great reason for rejoicing, but with a new year came new

hopes and possibilities. We might once more bask in sunny weather, and participate in the joys of an abundant harvest, which had, in the previous year, been denied us. Strange misgivings had forced themselves upon us. Was the climate going to alter permanently for the worse? Were we about to be slowly eaten up with disaster, low prices, a chilly atmosphere, floods, fever, and famine? If such memories appear distorted, they recall my own feelings at that period. After several discouraging years, which had given rise to serious discussion on the future of British agriculture, came a season upon which no one can look back without experiencing a cold shudder. It seems to haunt us still like a spectre. Everything had gone disastrously wrong. Prices of corn, wool, and live-stock had fallen, the new-milk trade was congested, the cheese trade was bad, potatoes rotted in the ground; for the first time, probably, in the history of Parliaments it was gravely suggested in the House of Commons that we might have "no harvest"! or, in other words, that the promise of "seed time and harvest" was, for once at least, about to fail. Happily this intense gloom has passed away. Those of us who have been spared to see the birth of 1890 have once more seen the sun regain his power and free himself of his spots. Nay more, we have seen dry summers and longed for rain, as in 1879 and some of its predecessors we longed for a short cessation from drenching rains and sodden fields.

Without detailing the story of the "Eighties," it may shortly be said that never has there been a period of greater activity of thought, of proposed alterations, of attention to agricultural matters, than we have witnessed during the last ten years. This has been in a great measure produced by the necessities of landowners, who found with dismay that their land was no longer sought after by eager competitors. Rent, which had been regarded as representing a solid interest upon the market value of land, was at last seen to depend entirely upon the profits of farmers, and as a consequence the market value of land also fell rapidly, as an uncertain investment.

Landlords awoke to the gravity of the situation, and began to co-operate with leading tenants, in order, if possible, to find a way of escape from a serious dilemma. The effect has been salutary to a degree beyond what might have been expected; so that, in spite of the fall in the price of wheat, we start upon a new decade in better spirits and with renewed hopes.

The "Eighties" may be summed up as a decade of disaster. Many farmers have succumbed through bad prices, disappointing summers, and harsh, expensive winters. We are,

however, called upon to take a wide view of the position, and therefore note that, while many have suffered, there are others who, by taking land cheaply and stocking their farms in a time of low prices, have seen their capital rise in value, and have had no reason to repent embarking in farming business. I find during the first half of the decade evidence of extreme discouragement, while since 1885 there has been an increasing hopefulness, as, for example, is to be seen in a series of articles written in 1886 at the invitation of the late Mr. John Chalmers Morton, entitled "Saved by Hope," contributed by Sir John Lawes, Sir James Caird, the late Mr. James Howard, Mr. W. J. Edmonds, Mr. Bernard Dyer, and other representative men.

Disaster is to Englishmen the trumpet-call to action. Accordingly, no sooner had farmers begun to realise the gravity of their position than they commenced to exert themselves with a will. Increased interest in dairying, in live-stock, and in grass-land, are the principal directions in which we have been moving. The high price of mutton, and the improved price of wool, have also been features of an encouraging nature. Neither must we ignore the importance of the rapid return of commercial prosperity to this country, which must react favourably upon agriculture, by stimulating the demand for agricultural produce. We have heard a good deal of bi-metallism, but probably nothing will be more likely to damp down and take the life out of this question than a general return of prosperity to the great industries of the country.

What lessons may be gathered from the events of the ten years now closed? Never has there been a time of greater instruction, chiefly because farmers have been induced to read and compare notes by meeting each other, more than at any former period. I shall therefore take, as the first lesson of the past decade, the importance of united effort.

1. Combination and Association.

The depression in agriculture has taught us the value of combination and association, and the agricultural press has been found to be the principal means by which exchange of ideas could be maintained. The demand for membership of societies and for agricultural periodicals has increased amazingly. New societies have sprung up in large numbers since the first rumours of acute agricultural depression were bruited abroad. The activity of the older standard societies has been greatly stimulated, and the Chambers of Agriculture have been

of great use as a means of communication with the Houses of Parliament. One lesson which we have learnt, and which will, no doubt, be followed up, is that of combination.

2. *Education.*

Previous to 1880, agricultural education was restricted in its operations. The examinations of the Royal Agricultural Society, of the Highland and Agricultural Society, and of the Science and Art Department, were in full force, as at present, but there had been no new departure for many years, and the Royal Agricultural College at Cirencester was the only technical institution devoted to the training of agriculturists, although there were several schools in which agricultural science was taught. The opening of the Wilts and Hants Agricultural College was announced in 1880, and shortly afterwards the name was altered to that of the College of Agriculture. The Surveyors' Institution at 12 Great George Street became, not only a professional, but an examining, body. The charter of incorporation of this institution confers powers which are likely to exert a most beneficial and stimulating effect upon the profession of land agents and surveyors, and to render it for the future imperative upon every one who aspires to enter it to qualify by passing prescribed examinations.

The air is now, indeed, full of schemes for agricultural education, and the lines upon which it is likely to develop are indicated in the report of Sir Richard Paget's Departmental Committee of 1887. I must refer readers for details to the two bulky volumes embodying Mr. Jenkins's labours in North Germany, France, Denmark, Belgium, Holland, and in the United Kingdom, presented in 1883, treating, not so much of the highest education suitable for gentlemen farming their own land, as "for bailiffs and small tenant farmers, and the lower education for farm-labourers and peasant proprietors; also the instruction in the rudiments of agriculture given in elementary schools."

My task is to indicate the lessons of the decade, rather than to describe movements, however important; and an exhaustive account of the various proposals, or even of recently-opened schools for agricultural and horticultural instruction, seems scarcely to be called for within the limits of this necessarily short article. It does not, however, seem probable that the patriarchal system of the Continent will ever find a place in the United Kingdom. Hitherto State interference has been repugnant to the genius of the English people, and personal energy and self-help have been the fundamental principles of progress. No one can say how far this condition of opinion is

likely to be permanent; but of this we may be assured—that one of the great lessons taught by the "Eighties" is the necessity for systematic instruction in agriculture in all its branches.

Education is not only necessary in school and college days, but throughout life. It seems, therefore, desirable to refer to the efforts made by all the great societies to promulgate dairy instruction by lectures and working dairies at our principal agricultural shows. The agricultural press has developed to a marked degree during the decade, and the circulation of the numerous papers devoted to agricultural matters has largely increased.

3. *Dairying.*

It is scarcely too much to say that modern dairying arose during the "Eighties." I am aware of the danger of formulating too strictly, and, no doubt, interest was awaking in years previous to 1880; but it is none the less true that the keen interest now seen on all sides in the dairy arose after wheat ceased to be a profitable crop, and the great movement in favour of laying down land to permanent pasture set in.

Among the novel features at the Kilburn Show of 1879 was the International Dairy, and the Laval cream-separator was introduced the same season. It was, however, subsequently that we began to seriously modify our practices by adopting the now general plan of washing butter in the churn, arresting churning at the point of granulation, forbidding the use of the hand, the introduction of "butter-workers," and improved methods of making up and packing butter. A modern dairy, with its Jersey, Dorset, Cooley, Schwartz, or centrifugal systems of separating cream from milk, its improved churns, Scotch-hands, ice, butter-baskets, &c., forms a striking contrast to the old-fashioned shallow pan, barrel-churn, and butter-tub; and although there is always a danger in increasing appliances beyond what is really necessary, there can be no doubt as to the solid progress which has been accomplished. To tell British dairymen that they were being beaten on their own markets by the Danes was likely to kindle the same spirit of resistance to Danish rule which glowed in the breasts of our forefathers in the time of Alfred, and no sooner was the challenge thrown down than it was accepted. It is not, I think, too much to say that the best systems of making British butter and cheese are now fully equal to those of any foreign country. What is now required is the promulgation of the art among the rank-and-file of dairy-farmers throughout the land.

On the subject of imports I will not say much. The total

imports of butter and margarine in 1879 had risen up to 2,045,399 cwt., while cheese had reached 1,789,721 cwt. In 1889, imported butter had only risen in quantity to 1,927,469 cwt., and margarine to 1,240,769 cwt. Cheese had reached 1,909,545 cwt. These figures are not alarming. It is true we are relying more upon the foreigner for our supply of butter and cheese than we were ten years ago. Alarmists, however, appear to forget one important factor—namely, that of price. So long as our ports remain open, it is price which will regulate imports, and the only way of checking them would be a diminution of quotations, an alternative which would scarcely find favour among our own producers. That London provision merchants should prefer French and Danish butters to our own was a more serious feature, and one of the lessons of the decade has been the necessity for improving the quality of our own dairy produce.

The new trade in milk had already reached great dimensions before 1880, and better prices were then realised than now. It is interesting to note that the increase in population of England and Wales is at the rate of 1·36 per cent. per annum, and that on a population of 26,000,000, which was the figure of the last census, there must be an annual increase of about 354,000 souls. The increase during the last ten years would, according to these figures, be 3,540,000 persons; and on the assumption that each unit of population would consume a quarter of a pint of milk, the extra number of cows required would be 900,000. Further, if 3 acres of grass-land are required for each cow, 2,700,000 acres of grass would be required to meet this increased demand alone. It seems, therefore, probable that, as in the last twenty years we have added 3,129,966 acres to our permanent pasture for all purposes, the supply of grass for cows scarcely keeps pace with the increase of mouths for milk, to say nothing of cheese and butter.

The supply of new milk is peculiarly a home trade, and is safer from foreign competition than that of any other commodity. The introduction of milk-registers, of improved cows, and of improved rations for cows, have all assisted to encourage a larger yield of milk per head, and the old figures of 450 to 500 or 600 gallons of milk per cow per annum have gone up considerably during the last ten years. Thus, in January 1889 Mr. George M. Chamberlin contributed a record in which the yield of milk per cow of three good dairy races from February 1888 to February 1889 was as follows:—

	Gallons
Shorthorns	872
Ayrshires	704
Jerseys	690

The better management of cows, and the improved manipulations of milk, must thus be considered to have been one among the important lessons of the "Eighties."

4. *Permanent Pastures.*

One important matter has been pressed upon our attention in a particularly marked manner during the decade, although the movement started about 1869. Mr. Mechi and Mr. James Howard were both, in their time, advocates for breaking up pasture land, and many of us can remember when one proposed means for developing the resources of British agriculture was the ploughing up of our pastures. With the fall in the price of corn, which assumed an acute form from 1880, increased attention was given to the laying down of land to pasture. Precisely those soils which were hardest hit by the fall in wheat were the most suitable for grazing, and hence every one has been advocating the laying down of clay land to pasture. The change is well illustrated by comparing the proportion of land in various crops, or in grass, upon 100 acres of average land in England as between 1869 and 1889. The average result throughout the country shows that on 100 acres of land the following changes of cropping have actually taken place :

	1869. Acres.	1889. Acres.
Wheat	14.6	9.4
Barley	7.9	7.1
Oats	6.4	6.5
All green crops	11.4	10.1
Rotation grasses and clover	8.6	11.5
Permanent pastures	43.2	50.7
Other crops	7.9	4.7
	100.0	100.0

These figures, while indicating a steady revolution in favour of pasture lands, also show that the British farmer does not act precipitately, but gradually alters his methods over long periods of time.

We have learned a good deal more about grasses than we knew formerly, and there is a greater anxiety to sow both the right descriptions of seeds and good samples of the same. Still, taking all matters into consideration, I question whether we know more about the best way of laying down land to pasture now than we did ten years ago. Twenty years since it was well known that land should be clean and in good heart when sown away, and that a good mixture of grass seeds and clovers should be used, and sown, either with or without a crop, in Spring or in

Autumn. There has been a slight reaction in favour of relaxing the conditions as to cleanness. Good seeds are also more easily obtained than formerly, but I do not see that much advance has been made in the mode of making pastures. As to rye-grass, it was always largely used, and it is largely used now, and probably will be in the future. The agitation against this grass, inaugurated by Mr. Faunce de Laune in 1882, and the reaction in its favour in 1889, have probably had less effect upon the ordinary practice of farmers than might have been expected. Many of us knew years before Mr. Faunce de Laune first inveighed against the use of rye-grass, that it is a useful grass, well worthy of a moderate position in all mixtures for permanent pasture; and we know it still.

The advantages of grass-land are:—

1. It is suitable to the English climate.
2. Its produce has maintained its market value.
3. The expenses are less than in the case of arable land.
4. The risks are less.
5. The net profits are larger than on arable land.

The difficulty in making pastures consists in the length of time necessary to accumulate the high percentage of nitrogen and available fertilising matter in the soil necessary to make rich grass-land. Rich land may sometimes be observed to "go down" itself to permanent pasturage, without seeds being artificially sown. Let any one watch what takes place when pond-cleanings, ditch-scourings, and even road-scrappings, are allowed to remain undisturbed for a year. He will see in a few months a thick and rich sole of grass covering the entire surface. Even with the best management, a few years must elapse before such a sole would cover a large field; but liberal applications of dirt, manure, and liquid manure especially, will greatly promote the change. Every care should be taken to follow the best methods, but many a roadside lesson teaches the observer the paramount importance of a high state of fertility.

5. *Fodder and Root Crops.*

The revolution which has led to the withdrawal of over 3,000,000 acres from a condition of arable cultivation to one of pastoral inactivity must be regarded as an indication of the increased value of all fodder-crops, including roots. Such an increase in value has no doubt taken place, but the low price of corn has also injuriously affected their cultivation. The problem is an exceedingly difficult one. Labour and expenses on the root-crop, with the prospect of 13 $\frac{1}{2}$ per acre gross return on the succeeding corn-crop, was one thing. Labour on the root-

crop, with a wretched prospect of 7*l.* or 8*l.* per acre from the next corn-crop, is another and less encouraging result. The upshot has been that arable cultivation has become in some cases no longer possible, and that the best course is found in laying down the field to grass.

I believe that the only plan to meet this grave difficulty is the maintenance of good stock which will pay more than an ordinary return. Fodder-crops are now more valuable than corn-crops, and it seems misleading to view them as only a means to an end. They must be grown for their own sake. I recently put the case of the root-crop against a cereal-crop as follows:—

"I have come to the conclusion that an acre of good swedes is worth a great deal more than an acre of good wheat.

"I will take 20 tons per acre of swedes against 4 quarters of marketable wheat.

"The case stands thus:—

	£	s.
20 tons of swedes are worth for feeding, 20 (14 lb.)		
stones of beef or mutton, at 9 <i>s.</i> a stone	9	0
Value of the dung produced by the consumption of 20		
tons of swedes, at 5 <i>s.</i> per ton	5	0
Total value	£14	0

	£	s.
4 quarters of marketable wheat, at 30 <i>s.</i>	6	0
$\frac{1}{2}$ sack of seconds and tailings, at 20 <i>s.</i>	0	10
Feeding value of 1 ton of straw = $\frac{1}{2}$ value of hay	1	10
Manure value of 1 ton of straw	0	10
Total value	£8	10

"A good crop of mangel-wurzel grown on suitable soils would arrive at a weight of from 30 to 40 tons an acre, and if judiciously fed, would leave in beef, mutton, milk, or store-stock, 10*s.* a ton, or 15*l.* to 20*l.* an acre. So much depends on the kind of stock which consumes the roots, that it is difficult to put a precise value on any produce consumed at home. But as I before said, the possibilities are almost without limit, and that because the value of animals is almost without limit. When, for example, a breeder of pedigree stock serves them with hay or with roots, the return may be much greater than when the same materials are eaten by ordinary or inferior stock."

These figures may be thought extreme, and if so it will probably be because the value of roots depends so much upon the season; and, besides, roots are a risky crop. All I contend is, that 20 tons of swedes or 30 or 40 tons of mangel-wurzel fed upon the farm are now more remunerative than corn; and

hence I see no objection to double root-cropping, or growing roots two years in succession upon the same land. An increased head of sheep or dairy stock would be the immediate result, and the smaller area of corn would yield a much better result per acre. Also, the second root-crop is obtained at much less cost than the first, as the land is clean and in good condition to begin with.

We have been gradually gaining an improved stock of root-seed, and a larger variety of cultivated fodder-crops. The cabbage tribe, among which may be mentioned thousand-headed kale and sprouting broccoli, have been more widely cultivated, and such changes render two root- or fodder-crops in succession more practicable now than formerly. The entire lesson is that we must now rely upon our live-stock for profits rather than upon corn-crops.

6. *Live-stock.*

The live-stock lesson does not require emphasising after what has already been said. The entire movement of the decade has been in the direction of live-stock. We have arrived at a standard of excellence in breeding animals which has placed English farming on a pedestal, and we must do our best to retain that position.

When a sheep can be made equal in value to an acre of corn, it is worth breeding good sheep. When the produce of a cow may be equal to three to four acres of corn, it is worth keeping good cows. There are possibilities as to live-stock which there never can be with regard to corn. I must not enlarge upon this point, but if any one doubts, let him look at the records of horse-breeding, cattle-breeding, sheep-breeding, and of pig-breeding, and he will see why it is that men of capital and judgment will do well to look to live-stock in the future, and to relinquish the cry about the low price of wheat. Wheat lands are the best for pasture, so there is no need to despair, even as to the future of clay land.

7. *Economy.*

Bad times lead to thrift, and one of the lessons of the last ten years has been the art of saving. It is to be feared that this lesson has not been so well learnt as some of the others. On the contrary, the wastes in agriculture are still deplorable. I lately drew attention to twenty common sources of waste on farms. It must not be thought that these wastes are all due to mismanagement on the part of the tenant. Many of them are owing to defective buildings, which render it impossible to

utilise straw, hay and root crops to full advantage, or to produce good farmyard manure.

We must, however, fix our attention upon the best examples of farming when endeavouring to discover the lessons taught in any given period; and taking the practice of our best farmers, there has been a successful effort towards the reduction of costs.

Economy is shown in the demand for good stock; in the care with which feeding-materials are purchased and mixed; in the interest taken in the proper ratio of carbo-hydrates to albuminoids; in the growth of the excellent system of selling cattle by live weight; in employing improved implements; in greater care in purchasing grass-seeds; in better methods of manuring; in a more rigorous supervision of labour; in greater care in the management of live-stock; in economy of straw and hay, and in other ways which might be mentioned. In all these points there was, and in many cases there is still room for improvement; but one of the salutary lessons of these sad times has been that, if farming is to be profitable, it must be carried on upon sound economical principles.

8. *Ensilage.*

The system of ensilage belongs essentially to the "Eighties." Previous to 1880 it was confined to a few amateurs and landlords; but in the autumn of 1882 the movement recrossed the Atlantic, like many other ideas which have been evolved in England and developed in America. The system, as first described in this Journal, was exceedingly simple, and might be summed up as the burying of grass in trenches. Such a crude method was not likely to remain unchallenged in England, and the elementary process of crushing down green fodder into pits, and weighting it with soil, soon developed into improved systems, with cemented silos furnished with hydraulic presses or levers bearing upon well-fitting boards. Chaff-cutters were also regarded as indispensable.

The first reaction from the system of expensively constructed silos, necessarily fixed to one position, was the making of stack silage with the aid of wire-rope pressure, invented by Mr. C. Johnson, of Croft, and, later, adopted by the Aylesbury Dairy Company. Presses were also made by the Ensilage Press Company, Leicester, Messrs. Pearson, and others, which are now in extensive use. But it must be allowed that a further and salutary development was effected when it began to be discovered that good silage could be made in stacks without any mechanical aid. This fact was extensively proved in the wet summer of

1888, and since, and nothing more strongly tended towards the general adoption of ensilage than this. At last, then, ensilage and hay-making stood on a common footing of simplicity. In the one case, the grass is dried before putting it together; in the other case, it is put together freshly cut.

As to pressure, all that is required is constant treading and constant rolling, especially at the sides, adding the green grass at intervals of from three to six days, so as to allow of settling and rolling. A vast amount of green fodder can in this way be made to occupy a small bulk, as 1 ton of grass may be easily compressed into 40 cubic feet, or into a space of 4 feet long, 2 feet wide, and 5 feet deep. A stack 10 feet high, 20 feet wide, and 30 feet long, may be estimated to hold 150 tons of silage. Some farmers, following the example of Mr. William Stratton, have made flat-topped silage stacks, and after it has settled sufficiently, have put the elevator down beside it, and made a hayrick on the top. This may not be magnificent, but it is practical; and there is not the least doubt that, by the exercise of a little mother-wit, the system of preserving grass in wet weather, as silage, may be adopted by every farmer in the country, both near the farm-buildings, for the use of cattle, and on the wider-lying fields, for sheep-feeding. There is room for all the systems, whether requiring a large initial outlay or not; but it is a matter for congratulation that the process has been reduced to its simplest form, from which it can healthily develop into more complicated methods if it is found necessary to adopt them. In the meantime, ensilage is favourably spoken of, and generally accepted, in almost every agricultural district.

9. *Science.*

Science has been the faithful companion and counsellor of practice during these years of depression. The position of science towards agricultural practice has become better defined, and there is less disposition to hurl unripe theories at our heads. We owe much to the temperate and practical manner in which Sir John Lawes has wielded his immense armoury of knowledge. The question as to the sources of combined nitrogen in soils has engaged a great deal of attention in this country. Until comparatively recently our leading chemists refused to allow that free nitrogen could in any form be assimilated by growing plants.

Recent researches have thrown doubt upon this position, and there is now a great probability that before long we shall know that the free nitrogen of the atmosphere may be of use in adding to the store of combined nitrogen in the soil. The paper contributed by Sir John Lawes last year to this Journal

points distinctly in this direction. "Thus," he says, "Hellriegel and Wilfarth have found, in experiments with various leguminous plants, that if a soil free of nitrogen have added to it a small quantity of soil-extract containing the organisms, that plants will fix much more nitrogen than was otherwise available to them in the combined form. It further seemed probable that the growth and crop-residue of certain plants favoured the development and action of special organisms. It is admittedly not yet understood, either in what way the lower organisms affect the combination, or in what way the higher plants avail themselves of the nitrogen thus brought into combination." Again, "should it be finally established that such an action does take place in the case of certain plants, though not in that of others, it is obvious that part, at any rate, of the gain of nitrogen by the soil supporting the mixed herbage of grass-land may be due to the free nitrogen of the air brought into combination under the influence of the action supposed." This is careful writing, but seems to foreshadow important changes in our views regarding the assimilation of nitrogen by plants; and if it can be shown that leguminous plants have this power directly, or through the agency of organisms in the soil, we may yet see our way to replenish our fields with nitrogen at less expense than at present.

So far as other manurial questions are concerned, we are not able to report any particular advance upon previous knowledge. Something almost amounting to a tirade against farmyard manure, as an extravagant and expensive dressing, has been indulged in by certain writers. I have not space to discuss this matter, but would point out that the tendencies of the times are evidently against this view. The greater importance of live-stock in our economy involves the production of farmyard manure; and when stock-farming is best carried out, there is reason to regard the dung as a mere bye-product inevitable to the maintenance of stock, and consequently as a cheap mode of restoring fertility. The absolute necessity of dung for root-cultivation or for the production of winter food for stock, at once elevates it in importance, while at the same time the low price of corn cheapens its production.

In the scientific use of foods much has lately been written upon the albuminoid ratio, and the fixing of dietaries upon this basis. Unfortunately for these theories, it must be allowed that Nature and agricultural practice have been beforehand, by providing or recommending dietaries which do, in point of fact, contain the best proportion of carbo-hydrates to albuminoids. Also, the great variation in the composition of grass, hay, silage, turnips, straw, and cake, renders it impossible to draw up

dietaries which shall unerringly represent an albuminoid ratio. To actually compose a mixed food having a definite ratio of this kind would necessitate fresh analyses in every case. It is also evident, that while one ratio is better suited for growing animals, and another for mature fattening animals, it becomes a difficult and complicated question as to what the ratio should be in the case of animals such as lambs, for example, which are growing in bone and muscle and laying on fat at the same time. The increasing practice of completing the fattening of young animals at an early age is evidently confusing with regard to any particular ratio of carbo-hydrates to albuminoids, and we shall probably find that farmers will prefer to be guided by their own traditions, based as they are on success, and by the exigencies of seasons and the market-price of certain foods.

10. *Diseases of Stock.*

The principal diseases which have caused anxiety during the last ten years have been anthrax, pleuro-pneumonia, foot-and-mouth disease and swine fever. An opinion in favour of inoculation was at one time prevalent, but this has steadily given way before the drastic method spoken of generally as "stamping-out." This view is now almost universally accepted, and the result is the repeated Orders to prevent removal of animals from county to county, the closing of infected ports, and compulsory slaughter. What appears still further to be required, is the compulsory slaughter of fat animals at the ports of debarkation. It has also been urged, with reason and with success, that compensation to our home breeders, rearers, and maintainers of stock, for the compulsory slaughter of these animals, should be made from the imperial taxation of the country, rather than from local rates.

These ten lessons of the "Eighties" might, no doubt, have been further subdivided and added to. The institution of a Board of Agriculture was one of the principal achievements of the past decade, and ought not to be overlooked in even the shortest epitome of progress during that period. The advance of this important movement to its successful issue in 1889 is in itself a lesson well worthy of separate mention. It is a fitting topic to conclude with, and if space had allowed I should have gladly enlarged upon it.

With a good Board of Agriculture, a gradual adjustment of farming business to altered values, and apparently a return of more favourable conditions as to climate, we may look forward with renewed hope to the future of British Agriculture.

JOHN WRIGHTSON.

THE REPORT OF THE ROYAL COMMISSION ON HORSE-BREEDING.

I SUPPOSE that the minutes of evidence taken before the Royal Commission on Horse-Breeding, which, together with their Third Annual Report, have just been presented to Parliament, may be held to exhaust the conditions and prospects of our floating horse-population up to date. There seems nothing more to be said.

Lord Rosebery's Committee did much the same in 1873. But there is an important difference between the two inquiries: whereas in 1873 the evidence was taken for purposes of investigation, in 1889 the evidence was taken for purposes of action. The Royal Commission, like the Rosebery Committee, investigated causes; but it is a body able to deal, and dealing, with the effects of those causes, which the Rosebery Committee was not. Persons concerned with the present and future of horse-breeding will at once realise that this difference imparts a particular value to the Blue-Book of 1890.

In the nature of things the future action of the Royal Commission—a body endowed with the motor muscle of action, *£ s. d.*—will conform, or at all events tend to conform, to the information gained from the valuable evidence of the thirty-three witnesses examined—veterinary experts, breeders, trainers, farmers, and country gentlemen; and any individual so minded, and sufficiently persevering, can perplex himself considerably in establishing where the thirty-three authorities examined agree, where they differ, and where they neither agree nor differ. But, however skilled in comparative criticism or the science of Blue-Books, this individual must be industrious. The 4,014 questions and answers, ranging as they do over the wide field of a wide subject, and over a variety of local, social, and economic considerations, may “put off” many people. Even with the assistance of an excellent digest, such persons as have not much time to themselves may not care to persevere. I am going to try to save them trouble by summing up the evidence given upon what seem to me some of the most interesting and most essential parts of the inquiry; and I am encouraged to make this attempt in the pages of the Royal Agricultural Society's Journal because the Royal Agricultural Society has for years past been at the pains of keeping its many members alive to the importance of horse-breeding, and actually initiated (with its premiums for stallions, offered for the first time at the Newcastle Show in 1887) the work which is now in full swing under the auspices of a Royal Commission.

I think it will be most convenient to look at the evidence under the following headings :—(1) general working, (2) stallions, (3) thoroughbreds *versus* cocktails, (4) mares, (5) hereditary disease and conformation, (6) roaring.

From the outset two great difficulties confronted the Commissioners. First, they had to provide facilities for breeding high-class half-bred horses—facilities which had almost ceased to exist; secondly, they had to induce breeders and farmers, and especially small farmers, to make use of these facilities. To meet the first they had to provide high-class sound stallions; to meet the second they had to devise some means by which the services of such stallions could be secured at a fee which the tenant-farmer could afford to pay. The second of these initial difficulties leads me up most naturally to my first heading.

I. GENERAL WORKING.

I need not here explain the premium system. Its principle is explicitly stated in the first Report of the Commission,¹ dated December 20, 1887, and still animates their policy. Moreover, it is well understood by everybody who is likely to read this paper. But the success of a premium system depends, not upon the simplicity or explicitness of its principle, but upon the smoothness and symmetry of its detailed working in the country districts. As several of the witnesses examined are or have been members of the District Committees who carry out these most essential arrangements, we are now able to test accurately the machinery provided by the “adequate rules and regulations” referred to in the Commissioners’ Report, and how far that machinery is workable.

Now, the evidence we have upon the general objects and purposes of the Commission, and the way we have set about carrying them out, is most encouraging. The approval (subject, of course, to modifications and suggestions) is practically unanimous, in some cases almost enthusiastic. Captain Heygate, it is true, takes a gloomy “bad’s the best” view² of the whole proceed-

¹ “Your Commissioners have come to the conclusion, having regard to the amount of the funds at their disposal, that they will best be expended in the forthcoming year in premiums for thoroughbred stallions suitable for getting ‘half-bred horses’ of general utility, to be offered at a Show in conjunction with that of the Royal Agricultural Society. . . . It appears to your Commissioners that, by a system of premiums carefully guarded by adequate rules and regulations, some of the difficulties which have hitherto stood in the way of breeders of horses (especially small occupiers of land) in securing the services of sound stallions, may be removed.” (Parliamentary Paper C. 5419 of Session 1888, p. vi.)

² Answer to Question 3194.

ing, being himself such a convert to the policy of despair that he has taken to breeding from unsound mares and keeping an unsound stallion for his tenantry.³ It must, however, be conceded that his environment, from a horse-breeding point of view, is qualified to sour a Mark Tapley.⁴ Lord Portsmouth was not encouraging; he seems to think our operations are on a humiliating and almost ridiculous scale. But his "drop in the ocean"⁵ view is no argument in the present case, and is met by the two pertinent questions put by Sir Jacob Wilson, "I presume you are aware that the action of the Government at present is only to supplement private enterprise, and does not undertake to supply all the horses that are required?"⁶ which those who read the evidence should keep before their eyes. Mr. Welby, though he has no opinion of our premium stallions, and is haunted by fond and becoming recollections of the giants of the past, gives unqualified support to the system; and this is the more satisfactory as Mr. Welby is absolutely the only witness examined who regretted above everything the Queen's Plates⁷ being done away with.

This sentiment for the *tempus actum* very naturally pervades much of the evidence; but it is satisfactory to remark the conspicuous absence of anything approaching indifference. The witnesses who agreed with the policy at present pursued by the Commission gave well-considered reasons for their agreement; whilst those who disagree have alternative and more or less constructed schemes to propose. Many of the witnesses would like to see more stallions, and many would like to see mares and produce getting their share of the Government money. But as to mares and produce, it is very generally admitted that

³ 3119, 3193.

⁴ 3206. (*Lord Ribblesdale*) "Then would you say that, to some extent, at all events in your district, the fault lies quite as much with the way in which the tenant-farmers manage their horse-breeding as it lies with the stallions put on by the Commission?" (*Major Heygate*) "Yes, certainly; the stallion might do if the mare was better. I live in the centre of the Hereford cattle-breeding districts. The farmer would feed the calf the first, and the hunter just having left his mother would have to do the best he could for himself, running about at nights, picking up acorns. What can you expect from such a thing as that?"

⁵ 2876.

⁶ 1845-6.

⁷ 3920. (*Mr. Welby*) "I am an old stager, and regret, above everything, the Queen's Plates being done away with, because they were the stoutest horses that used to win them."

3922. (*Chairman—The Duke of Portland*) "Taking into consideration the vast increase in the value of the stakes, do you not think that the money which used to be expended on the Queen's Plates is now expended to more advantage to the horse-breeding community?" (*Mr. J. Welby*) "Yes, I do now. I am sorry that it was given up, but I would not go back to the old plan. I was old-fashioned enough to think the contrary. I think the present system is excellent."

their participation must assume, with regard to mares—more money; and with regard to produce—more money, and a stage of progress which has not yet been reached. Thus, when it was pointed out by the Duke of Portland that the Commission could only deal with the funds at present at their disposal, and that an increased grant was a shaky basis for useful argument, the witnesses all preferred that the money should not be broken up, and that it found its best uses and employment in the subsidising of stallions.

Many, however, urged increasing the number of stallions by lowering the premiums. I have gone minutely into all the evidence given upon this point. It does not appear to me that a good case for lowering the premiums is made out. It is only by putting on a distinctly high class of horse that we can hope to knock off the unsound and indifferent stallions which have done so much harm—poisoned our blood, as Mr. Lumley Hodgson once said. Besides, in view of a brisk demand⁸ for stallions, to which many witnesses drew attention, we should surely be dropping back into the jaws of the old difficulty.⁹

Lord Harrington, a witness who speaks from wide knowledge and experience, would like to see the premiums reduced to 100*l.* or 150*l.*, and is so consistent in his view that he states it as his opinion that lowering the premiums would give us a no worse class of horse than raising them would give us a better.¹⁰ Such as they are, he thinks we are already getting the best. Mr. Jackson, of Whitecross, whose forbears bred Lottery, is in favour of lowering the stallion premiums,¹¹ not so much to increase the number of stallions, but to find money for a different premium system, which would permit of subsidising mares; but Mr. Jackson states expressly that his remarks as to mares and stallions apply only to the district in which he resides. Thus, although generally dissatisfied with the present scheme, he says,¹² when asked whether it might not be advan-

⁸ 1702 (*Capt. Fife*); 2174 (*Mr. James Martin*).

⁹ This difficulty is very clearly explained in the first report presented to Parliament, in the following terms:—

"It is a matter of common notoriety that, year after year, the United Kingdom has been swept by the agents of foreign Governments for the stallions and the mares best suited to their purpose, and they have been bought with public money, and taken from the country, frequently at prices with which it was impossible for private enterprise successfully to compete. The consequence of this has been that, with the exception of the highest class of stallions and of mares for the breeding of racehorses, this country has been left for the most part with the inferior and often unsound animals which the foreign agent has rejected; and the result has been a gradual, but marked, deterioration in the general breed for which England at one time was famous" (page v.).

¹⁰ 2444.

¹¹ 2996.

¹² 3075-6.

tageous in other districts under different conditions:—"It is advantageous in our own district: there is an advantage in it; I admit that. I do not say that it does not do good to a certain extent." Lord Portsmouth thinks that lower premiums will bring out a larger number of "useful" horses, that high premiums are won too much by good looks, and that good-looking horses often get very bad stock. In view, however, of the fact that, even with our high premiums, a large, though a diminishing proportion of the stallions exhibited annually have to be rejected for unsoundness, it may be doubted whether the animals which the lower premiums would bring forward would stand the test any better, or so well; whilst the higher-class animals would not be tempted to compete, and would probably be sold to go abroad or to the Colonies. Lord Combermere advocates lower premiums, under a scheme of county distribution, subject, however, to rules and regulations to be kept in the hands of the Commission.¹³ A scheme of the kind, he explains, is answering well at Tarporley. But it is to be feared that every county or local association has not the special instinct nor the machinery for its successful working. It must be borne in mind that Cheshire and North Wales have understood horse-breeding for years past.

To sum up. My own view, founded upon the evidence, is that the premium must be sufficiently high to be worth a man's commercial while to win, quite independently of his inclination as a breeder, his occupation as a farmer, or even his public spirit as a patriot. "What you make it men's interests to do, that they will do." Certainly Mr. Burke was right as regards *£ s. d.*; but when you drift away from that formula, you cannot be certain what men will do. Moreover, lowering the premiums raises another difficulty. If you limit the number of mares (which might be done on the present scale of premium, and which many witnesses suggested should be done), you must (on a lower premium) either raise the fees—and this will be defeating the principle of the premium system—or you must lower the fees, and let the stallion make it up in an increased and unlimited number of mares. To my mind, the Commission have wisely decided to maintain the value of the premiums.

I shall now glance at the evidence upon restricting the 2*l.* 2*s.* 6*d.* service of the Queen's premium stallions to tenant-farmers, which seems to me conveniently to belong to the first heading. Upon the whole, I think the general opinion is in favour of all faring alike. Lords Combermere and Harrington, Mr. Knight, and Captain Fife, would like to see the first fifty

nominations reserved to tenant-farmers. But it seems to me that, if we are to work up to our prime aim of breeding the best possible animal, this restriction is open to some reasonable objections.¹⁴

II. STALLIONS.

I am pleased to say that the evidence goes to prove that the sound premium stallions are driving the unsound horses off the road; so much so, that Mr. Dove says that in his district there are no longer enough stallions to serve the mares, the premium stallions having "boycotted" the horses which used to travel there, and driven them into districts where no competition of a sound kind need be feared. Whatever may be one's view of boycotting in Ireland, in horse-breeding—like exclusive dealing—it is absolutely commendable. The Duke of Beaufort told the Commission that a great many farmers around Badminton bring him animals to show or sell with twelve or fourteen crosses, of most absolutely sound blood,¹⁵ thoroughbred stallions having been kept at Badminton for the last seventy or eighty years. The Duke adds:—"I have no doubt that this system of the Royal Commission will have the same effect all over the country."¹⁶

The evidence in favour of careful breeding from sound-winded stallions, and the disastrous results of breeding from roaring stallions, is attested over and over again by the unhesitating answers of the professional and practical authorities examined. Professor Brown, when pressed by the Minister for Agriculture, said that to go on as we were doing would amount to something like a national misfortune.¹⁷ But we also have most satisfactory proof that the general movement which culminated in the appointment of the Commission is educating a party, and that the "folding of the hands" phase of an important branch of agricultural industry is overpast.

Mr. Porter, of Kingsclere, in reply to a question whether the work of the Commission had led to more attention being given to the purchase of stallions at blood-stock sales, says:—"Since

¹⁴ See Questions 2472-3-4-5-6. Lord Lonsdale, I hear, is allowing "Blue Blood" to serve thirty mares (in addition to the fifty he is required to serve) at the Commission fee. But this indulgence is *limited* to mares the property of tenant-farmers. This is a very real assistance to the tenant-farmers of the district.

¹⁵ 1708. (*Chairman*) "Is it your opinion that all the diseases in stallions and mares mentioned in the First Schedule should be considered as hereditary?" (*The Duke of Beaufort*) "I can hardly answer that question. I think roaring is very often hereditary, but I do not know about these other things. I never had any experience in the matter, and I do not know that I have ever bred from animals that were troubled with these other diseases."

¹⁶ 1711.

¹⁷ 99.

these premiums have been given I get inquiries now from farmers and different people about stallions which we never used to hear of before. If you get a sound, good-looking horse, there are plenty of people who will come to see him with the object of purchasing."¹⁹ And he replies in the affirmative to a question as to whether the work of the Commission keeps stallions in the country instead of their being bought to go abroad.²⁰

Captain Fife says much the same: "I consider that all people who are keeping stallions are encouraged to keep a very much better class of stallion than they otherwise would. I come across a great many people at Newmarket looking for stallions, and they always try, to begin with, to buy a sound horse and one they think good-looking enough to win a premium, whereas before these premiums existed it was not a matter of how good the horse was, it was a matter of how cheap they could get him."²¹ And Mr. Matthew Dawson, after pointing out the foreign demand we have to contend with, says (speaking of high premiums stimulating the home demand), "The more you give [in premiums] the more they will strive to find the animal."²²

There was a general consensus as to the minimum age at which a stallion subsidised by Government money should begin. Some preferred five, and one witness greatly fancied nine. Three was generally held to be too young, and four is probably a wise decision. As to the maximum, there was less agreement; but the practical men's ideas are summed up by Lord Combermere: "I would let him (the stallion) go on as long as he can get his mares in foal. The farmers will very soon tell you when he does not do that."²³

We have strong evidence in favour of stallions travelling by road instead of being located or going by train, although Captain Fife sends his own stallions by rail and finds it answer. Mr. Porter says that travelling keeps a horse in good health, and that he might walk twenty miles a day with advantage. Mr. Dawson thinks exercise is "a fine thing" for a horse; Mr. Cooper and Mr. Cookson consider a horse is far more likely to leave foals by travelling. General Thornhill suggests that the Queen's premium stallions should be *required* to travel occasionally, as a farmer would sooner use a stallion passing his gate at ten shillings than be at the trouble of sending to a premium horse at a distance. The stallion leader, and the inclination to treat the stallion leader—always a popular and often a thirsty individual—are, however, admitted difficulties.

¹⁹ 1535-6.

²⁰ 1538.

²¹ 1695.

²² 2692.

²³ 3384.

III. COCKTAILS.

Mr. Chaplin, in his Memorandum to the Report of December 1887, said, "I consider that horses with a stain in their pedigree, and which are not therefore in the Stud-book, are constantly found, and have frequently been proved to be, among the best and most successful of country stallions, and it is, therefore, inexpedient and undesirable, in my opinion, that they should be excluded from all competition for the premiums." The question of allowing cocktails to compete for the premiums did not, however, find favour. As things are, we have a breed so vitiated that we have almost to breed the mares which are to put it right again, and a rigidly pure strain on the sire's side seems to be essential in the opinion of most of our witnesses.

If we had the kind of mares Mr. Jackson speaks of, the idle mettled mare going straight back to "Lottery" and "Blacklocke," it would be quite a different thing. Under those circumstances, speaking for myself, I should let in cocktails, assuming they had proved themselves racehorses, or could prove a certain number of crosses of pure blood. I have a cocktail myself, which I consider the model of a country stallion. But we have not these mares, and the mares we have to make shift with need to be mated with pure blood. Such cocktails as "Snowstorm," "Emperor," and "New Oswestry," are exceptions, although, as the owner of the two former, Mr. Chaplin's predilection for cocktails is most natural.

But granting the excellence of such animals as these, there seems little confidence just now in anything but pure blood. Some witnesses have none,²⁴ and Lord Harrington must have a

²⁴ 1977. (*Earl of Coventry*) "Do you believe in a pure strain of blood on one side?" (*Mr. T. H. Hutchinson*) "I do indeed." 1978. "And you do not expect to find a good high-class hunter got by a half-bred horse?" "I never saw one in my life."

2147. (*Major-General Ravenhill*) "And you think that the premium should be given to thoroughbred stallions?" (*Mr. James Martin*) "To thoroughbred stallions only; no half-bred ones for me, 'Snowstorm' to wit." [I am afraid this must have hurt Mr. Chaplin's feelings!]

3917. (*Chairman*) "Do you approve of limiting our premiums to thoroughbred stallions?" (*Mr. J. E. Welby*) "I would have nothing but pure blood on any consideration whatever." 3918. "You would on no account admit a cocktail, would you?" "I would not on any consideration whatever. Yet I have seen very good instances to the contrary."

2881. (*Chairman*) "Are you entirely in favour of our premiums being given to thoroughbred horses?" (*The Earl of Portsmouth*) "Certainly. I think that a cross-bred horse does an infinity of harm." 2882. "You would not give any part of our money to cocktails?" "Certainly not. I would not give a penny to them, because you do not know which way the stock follows."

2483. (*The Earl of Coventry*) "Do you approve the action of the Royal Commission in confining their prizes only to thoroughbred stallions?" (*The Earl of Harrington*) "The only way out of that, to my mind, is to have a rule of this sort—thoroughbred stallions or horses that have won a race worth at least 200l." (See also 2487).

pure strain on the sire's side, or insists upon such galloping cocktails as have won a race worth 200*l.*

The evidence as to the value of a stallion's performances upon the turf is most interesting, and not, upon the whole, what might have been expected. Mr. Porter thinks performance upon the turf no recommendation for a stallion to get half-bred stock, and is backed in this opinion by Dr. George Fleming and Mr. George Williams, both experts with practical knowledge. But Lord Harrington and Mr. Matthew Dawson take the view that performance is most valuable. This is the kind of point upon which every practical man makes up his own mind. For my own part, even for breeding half-bred stock, I should prefer a performer, and I would commend Mr. Welby's advice upon this question.

In reply to the question put by Mr. Gilbey: "Supposing a blood sire has good legs, straight and true action, and sound for getting good, general-purpose horses, should he have won races?" Mr. Welby says, "I think that is the only test that is left to the horses on the turf. What other test than the winning post can there be? It shows courage, speed, and what ought to be endurance. It is the only test of prime excellence. I should think the best test is running oftenest and winning, and if he has as many bumps as you like, if he had done that, that shows that he has courage and speed. You can have no truer test of excellence than the race-course and the winning-post. If you do not get it there, I do not know where you will get it."²⁵

A great deal of evidence was given upon a suggestion first made, I think, by Lord Coventry. This suggestion was that a clean bill of health for life should be given to a thoroughbred horse coming out of training at five or six years old, with a certificate of soundness. This, of course, would mean that such a horse, competing for the Queen's premiums, would not have to be examined. The evidence upon this point is very conflicting, but I think a distinct case is made out in favour of Lord Coventry's suggestion.

IV. MARES.

The subsidising of mares cannot be contemplated with the money at present at the disposal of the Commission. I do not think any other view than this can be taken after carefully reading through the evidence. It seems to me that if any principle of genuine self-recovery still resides in horse-breeding, as I

think it does, we may confidently look to this difficulty working itself out as the good results, we may with justice anticipate from the work the Commission is doing, become more recognised.

But we must not get away from the fact that we have almost to breed our mares. Although there is more breeding within the last few years, Mr. Boughton Knight²⁶ is probably quite right when he says that, in spite of the fact that more people are breeding, he does not know that any breeders have bought mares specially for the purpose of breeding, at all events in his district. The same view may be inferred from the answers of nearly every witness examined upon this point. This means that, so far, the brood mare, as a brood mare, has not recovered the specific value she once possessed in England.

Lord Harrington and Lord Combermere are both very much alive to the desirableness of helping the mares, but they approach the same end by different ways. Lord Harrington thinks we must get at the brood mares by giving good money prizes to young stock all over the country, bred by tenant-farmers²⁷ (not only the produce of premium stallions²⁸), and he says:—"I think brood-mare judging is the most difficult thing in the world; I think I would sink the brood mares and give the prizes to the young stock. The farmers will very soon find out what bred the young stock if the prizes are given to them;"²⁹ but all this is qualified by an "if you had more money."³⁰

Lord Combermere says we must confine our £ s. d. efforts to stallions, and that we can do nothing for mares in the way of subsidising or prize-giving at present. But he suggests a solution. The price of troop horses ought to be very much increased. "By that means you would get a far better horse, and I do not think that in the long run it would cost the Government a farthing more than it does now. As it is at this moment, you are behind the foreigner, and I want to put you before the foreigner. All the best mares go out of Ireland and out of this country, I know. I know that at Lincoln Fair this year 100 mares went to one place abroad because the foreigners gave 15*l.* more than we will give;"³¹ and his general remarks upon the foreign demand, both in respect to mares and stallions, are very significant.³²

²⁶ 3229.²⁷ 2394.

²⁸ 2395. (*Lord Harrington*) "Supposing persons like myself, who breed privately and get the best mares we can, were to send our young stock against the tenant-farmers, we should choke them off directly. I should not limit it to premium stallions, but I should limit it to horses that had been advertised to serve tenant-farmers' mares at a fee not exceeding 2*l.*"

²⁹ 2392.³⁰ 2393.³¹ 3332.³² 3405-3410.

Mr. Welby would like to see Lord Harrington's ideas as regards produce (and as carried out at Lord Harrington's own shows) developed, and thinks this would benefit the mares. He tells us later:—" . . . I want to get as much money as it is possible to get together for the benefit of mares and early produce. That is the only panacea that I can see. . . ." ³³ Captain Heygate again distressed me; and his view of mares generally furnishes another way of accounting for his equine Schopenhauer philosophy. Mr. Gilmour put to him the following question:—"The most practical way to get an average breed of sound mares in the country is, in the first place, to put sound stallions at a low fee within the reach of these tenant farmers; are the fillies thus produced not likely to grow into better mares than the produce of these horses that the tenants in your district have been using up to now for some years past?" And Major Heygate's reply was:—"Using these horses cannot hurt, but I do not see that it will do much good, because I think whatever horse is put to these mares it will produce an animal which it will not pay to rear." ³⁴

Mr. Jackson says as to mares—a point to which he has given much attention—"It would be better if something could be done to keep more mares in the country," and that giving prizes for good brood mares "would encourage the breeding of horses." He adds, "we are far shorter of mares than horses in our district, I think it is so all over the country. I travel about," he says, "a good deal, and I fail to see any good mares hardly anywhere, at any rate, very few. I think especially that the well-bred mares have decreased." Mr. Jackson, however, agrees with the large majority of witnesses that no veterinary examination can be imposed upon mares, and thinks that until we give the mares a subsidy we cannot "come at it." ³⁵

Lord Portsmouth says it is a "waste to see the wretched mares that people put to the premium stallions," but he thinks a selection system presents difficulties. He says, "The difficulty would be that you would give such offence, and anything of that sort deters a man from breeding. Wretched, shabby-looking, little mares are very often the best bred mares. If you begin

³³ 3872.

³⁴ 3156.

³⁵ 3056. (*Mr. T. B. Jackson*) "You do not give the mare any prize; if you give the mare a prize, then you would come at it. You do not subsidise the mare, but you subsidise the horse, and you bind them to be sound, and I do not think that you can go to the mare and have her examined. People would turn round, and some of them would not allow their mares to be put to your horse. I do not think that anybody should interfere to prevent a man from breeding from a sound or an unsound mare."

by taking brood mares from their appearance you would cast very many of the best brood mares in England.”³⁶

Thus, upon the whole, we may take for granted that the present money is insufficient for the subsidising of mares, and that a selection of mares, desirable as it may be, is therefore not practicable. Farmers would not like the interference and the possibility of having their mare crabbed and made unsaleable; and it is doubtful if they would consider this risk worth running for the sake of an increased prospective value of their stock, which, however, might be fairly assumed. Thus, as things are, we must breed our mares, and Mr. Welby, when asked if he could suggest any better means of improving his mares than by breeding fillies from good sound stallions, said: “Oh, everything depends upon that. One of the first things I should encourage would be the breeding from the two-year-old mares;”³⁷ and again, when asked whether, in his opinion, in attempting to improve the horses of this country, the Commission had not exercised a wise discretion in confining themselves in the first instance to stallions, replied: “That is my opinion, and always has been, that the female animal was the one wanted, because it comes home to the producer and farmer.”³⁸

The fact is, that for some time past farmers have been very poor. In the Midlands the fall in the prices of stock, in Holderness and Lincolnshire the fall in the price of wheat, have ruined, or half ruined, many farmers, obliged them to give up hunting and breeding, and to sell the idle mettled mare to the foreigner, or even to the cahman. The Fylde, formerly a great district for harness-horses, has turned its attention to breeding draught-horses as giving a better return. In the grazing districts, a man who, in olden days, kept active hacks to ride about his business, and which bred him many a good foal, now gets into a railway compartment; and in the northern Dales the small farmers no longer plough a patch of land for the oatmeal which used to be the staple food of these districts; it is cheaper to buy wheaten flour, and the light-legged mare which did the ploughing and carried her master about on fair-days no longer earns her keep, and so has disappeared. A competent authority declared at the Rosebery Committee, that in Yorkshire sheep and cattle had eaten up the horse; and it is little satisfaction for us now to be told that they in their turn have been eaten up by Australian beef and Australian mutton. Still, for my own part, I believe in that principle of self-recovery to which I have already alluded.

V. HEREDITARY DISEASE AND CONFORMATION.

As I am not an expert, I shall say very little upon this head. The importance of rigorous veterinary examination is most conclusively proved by the evidence, and the advantage of the Commission making public a Schedule of Diseases held to be hereditary, and therefore disqualifying the stallion from winning a Queen's premium, is strongly advocated. I think any person reading the evidence carefully cannot fail to be struck by the *reasonableness* of the evidence given by the professional experts, and by their anxiety to subject their theoretical opinions as to the transmission of disease to the practical opinion of experience.³⁶

The evidence given by the practical men that soundness is a vital essential of success, and that any deviation from soundness is most woeful error, was, if anything, more emphatic than the evidence given by the professional experts. I give here the Schedule of Diseases ultimately agreed to:—

ROARING-WHISTLING.
CATARACT.

RINGBONE.
UNSOUND FEET.

NAVICULAR DISEASE.
SPAVIN.

I feel confident that this will be approved of very generally, and that it reduces to a minimum any risk of discontent or disappointment at our stallion shows in future. A competitor now knows exactly the questions his horse has to answer if sent to the veterinarians.

A good deal of interesting evidence was given upon how far the responsibility of rejection should be shared by the judges. But I think the general feeling is that the veterinary surgeons must incur the responsibility of rejection—a responsibility they are quite prepared to incur; the judges on their side incurring the whole responsibility of selection—i.e., a horse must not be rejected by the veterinaries for conformation or action. Curbs took up a great deal of our time and attention. To my mind, curbs, splints, and weak feet, all of which were

³⁶ I cannot refrain from quoting Professor Brown in this connection. He says (7):—"I think it is fair that I should say officially that I am in the same position as the majority of persons in my profession in regard to the actual practical knowledge in the transmission of disease. The vast majority of us accept the mere statements that are made by persons who have had the opportunity of making direct observations." (57) "I think it is obviously the case that there are very few men who could say positively, from their own experience, that the different diseases which are recognised as unsoundnesses are capable of being transmitted. The fact of being able to say so suggests a very critical mind and the continuance of observations over a great number of years for that particular purpose."

suggested as possibilities, were very rightly omitted from the final Schedule. A horse will not be rejected for curbs on good hocks, and we shall trust to the judges not to pick bad-footed, curby-hocked horses for premiums. On good hocks curbs are quite immaterial; so are splints, as regards the present purposes of the Commission; whilst weak feet are so much a question of opinion and degree that they can hardly be satisfactorily defined. Evidently we must have the best judges that can be got, and trust make-and-shape and action to them; and with this express Schedule we can hardly go wrong now over the veterinary examination.

Shakespeare speaks in "King Lear" of the madness of trusting in the tameness of a wolf, a boy's love, or a horse's health; he was certainly right about the last. If men and women were as unsound as horses seem to be, we could not get along at all. "Horses," said Mr. Daly in this connection, "are extraordinary things"; and after hearing the evidence relating to their ailments, and to their capacity for ailments, one cannot but agree with him.

VI. ROARING.

Roaring properly belongs to the foregoing heading; but we have heard so much about it that I have given it a heading to itself. Mr. Dawson³⁷ told us that he thinks all horses become roarsers to a certain extent after a certain age, ten years being the age suggested; and as he thinks a roarer almost universally transmits the evil to his stock, we are tempted to ask, "Who, then, shall be saved?" But what, I take it, Mr. Dawson really means is, that a roarer-bred pernicious roarer shows himself to be so at three years old; and I do not think he attached the same importance to roaring if it is developed at six, or eight, or ten years old; it is then more likely to be the result of a severe cold, or of stupid stable management. Mr. Porter³⁸ takes much the same view. He thinks that two-thirds, or even three-fourths of our stallions go roarsers from the latter cause—i.e., stupid stable management—and he draws attention to the danger of certain strains of blood which are sure to produce roarsers. The following information is noteworthy, coming from Mr. Porter:—"I think the chief cause of roaring is early foaling. I do not think you would find a horse foaled in May a roarer. I think, if you were to take all the racehorses in England foaled in that month, you would not find a single roarer. I think it is the early forcing; the foal is born at a time when he is exposed to climatic influences that affect him perpetually."³⁹

³⁷ 2659.

³⁸ 1508.

³⁹ 1472-3.

This, I believe, was an opinion held by Sir Joseph Hawley, and I remember Captain Machell telling me at Newmarket last winter that, *prima facie*, he was disposed to think Mr. Porter was right. None of our other witnesses, however, were prepared to assent to this dictum from their own experience. Mr. James Martin⁴¹ agrees with Mr. Dawson that hereditary roaring will come out before a horse is six years old.

Professor Brown thinks roaring has increased in the last twenty-five years. In answer to this question by Mr. Chaplin, "Do you attribute it [roaring] chiefly to this: first of all that there are a great many more roaring stallions, and secondly, that people are more careless about breeding from them?" Professor Brown replied, "What I mean I had better express in this way, that people were always equally careless, but as roaring is accumulative by being transmitted in this way, it naturally follows that every year there will be a certain increase in the number of roarers, and if the people who breed go on pursuing the same system, the result of that naturally must be that the disease constantly increases."⁴²

Mr. George Williams, on the other hand, does not believe roaring has increased in the last ten years, and does not think short distance races have anything to do with it. Horses, he observes, which have never made an effort in their lives become roarers from heredity, and both Mr. Porter and Mr. Dawson acquit racing of this charge, although Mr. Porter thinks five-furlong races irritating to everybody. I suppose he excepts the man who has backed the winner. Dr. Fleming dislikes short races, thinks roaring on the increase, and attributes this increase to short races and careless breeding acting equally.⁴³

But I do not think that the sum of the evidence goes to show either that roaring has sensibly increased or that it can be attributed to short races. We must remember how many more horses are used for fast work now; how many more people—consider ladies alone—hunt and really ride now; how horses are almost universally clipped now. All this was quite different twenty years ago, and if you take these considerations into account and balance them against the proportion of roaring to-day (*pro rata* to our horse-population) as compared to the proportion of roaring, say, twenty-five years ago (*pro rata* to the horse population of that day), I fancy the percentage would not be so very different. Sir Roger de Coverley's stone-grey horse belonged to an earlier period still; but for my own part, although I might have excused him the indignity of punching him to

⁴¹ 2208.

⁴² 93.

⁴³ 953, 958, 989.

see if he grunted, I should certainly have had him examined for his wind.

Dr. Fleming and other witnesses, however, are perfectly right in contending that by breeding for speed, and from fashionable speedy blood, in order to win richly endowed short races, we are sacrificing stoutness. A stout horse, in my own experience, is usually a hardy horse. If you lose stoutness you will get a less hardy horse, a less good feeder, and I think consequently more subject to colds and coughs, and so more liable to go a roarer. We all know the kind of weather an English hunting season can treat us to. Tot up in your imagination the number of horses out hunting in such weather all over England; clipped, and out of more or less heated stables. Imagine them hanging about raw woodlands or exposed uplands in bad scenting weather until the hounds go home. Can we be surprised that many half-bred horses go roarers, and after they are five years or six years old?

For my own part, from the evidence about roaring in general—not roaring in connection with subsidising a premium stallion—I think we only heard what we expected to hear, and what we pretty well knew we should hear. We understand roaring is less common in France, as they are more careful in their breeding and pay enormous attention to soundness. Many witnesses told us it was impossible to sell an unsound one—horse or mare—to a foreigner. Still, I would rather trust a Yorkshireman to breed my horses, all said and done.

The evidence throughout abounds in so many out-of-the-common-way bits of experience and nice observation, that I should have liked, had space permitted, to deal with some of these. Every witness's evidence (apart from its value as a contribution to the subject) has something or other about it—be it an experience, or a fancy, or a suggestion—which is individual and native.

In conclusion, I think the evidence absolutely proves that, with proper remedies, there is a good prospect of the revival of horse-breeding upon the best lines and in allegiance to our best traditions; and I think that the evidence also proves that, as far as it is able, the Commission is applying these proper remedies, and wisely supplementing private enterprise and the well-timed efforts of public societies, such as the Hunters' Improvement Society, and many local clubs and associations.

Obviously, no Commission, however well-intentioned or well-informed, can regulate the economic laws of supply and demand; nor can it make any particular branch of commercial industry

pay, except by a bounty or protective system on a scale that cannot for a moment be contemplated in this country. For my own part, I should never recommend any such scheme to be so much as mooted.

What the Commission can do, and what I claim it is doing more effectually every day, is this: it is making the breeding of half-bred horses possible and reasonable for the farming community, whereas before the Commission got to work the breeding of half-bred horses by the farming community was hardly possible or reasonable.

One last word as to the foreign demand. Let us stimulate and let us provide for that demand by every means in our power. But let us stimulate and provide for it with English *produce*, and let us recognise clearly that the stallions and mares it has paid the foreigner so well to come and buy, it may pay us still better to keep and breed from.

TRIBBLES DALE.

TUBERCULOSIS IN ANIMALS, AND ITS RELATION TO CONSUMPTION IN MAN.

DURING the past eight or ten years tuberculosis, or consumption, has received more attention than any other disease of either man or animals. The reason of this has been not only that the belief in its contagious nature was becoming more generally accepted, but the discovery by experiment that the disease in man and animals was the same, and inter-communicable from the one to the other. When this discovery was made, the question naturally arose how far the flesh and milk of tuberculous animals might prove injurious to man when used as food.

Thus, from being a medical or scientific question, the subject became of as much interest and importance to the stock-owner and others connected with the cattle trade, as to the sanitary medical officers and the guardians of the public health. The subject has frequently been discussed in the columns of the daily and agricultural press, and to those unacquainted with medical literature it may have appeared as if some new disease had been discovered. Such, however, is not the case: the history of tuberculosis has no well-defined starting point.

Some authorities infer from the mention of the "pining animal that was not to be eaten," that the disease was known to Moses, but this seems doubtful. The Jewish community

in sanitary matters still obey the mandates of their great law-giver, and in the inspection of animals slaughtered for their consumption not only is the tuberculous animal condemned as unfit for food, but all those in which other diseases of the lungs or other internal organs are found. Celsus applied the Latin *tuberculum* (a little lump), the derivation evidently of the present word tubercle, to certain diseased conditions of the internal organs in which deposits or small lumps were found; but under this general term probably different morbid changes were included. In medical nomenclature, until recent times, the term tubercle was not definitely restricted to the one specific disease as it now is, but was used in a general sense to describe morbid changes in which little lumps or nodules were found.

The common names by which this disease when affecting cattle is known to the stock-owner are "grapes," "pining," and "wasting," and the affected animals are spoken of as "wasters" or "piners," terms sufficiently expressive to convey some idea of the generally miserable and worn-out aspect of animals suffering from the chronic or advanced stage of this disease.

All tuberculous animals, however, are not in this wasted condition; a beast in good condition fit for the butcher, and apparently in perfect health, may on slaughter be found to have tuberculous deposits in its lungs and other internal organs, while, on the other hand, the "waster" or "piner" in the most emaciated condition may, when killed, be found quite free from tubercle or other organic disease, the emaciation being due to other general causes of debility, such as excessive secretion of milk or insufficient quantity or quality of food. Formerly veterinarians in this country spoke of tuberculous animals as "scrofulous," and considered the tumours known as wens, sitfasts, or clyers, as ordinary manifestations of this disease. With our recently extended knowledge of the intimate pathology of tubercle, this notion has been abandoned, and in an investigation conducted by Professor Crookshank, of King's College, London, the results of which were published in the Annual Report of the Agricultural Department of the Privy Council for 1888, it is shown that these tumours or wens are quite distinct from tubercle, and due to a totally different kind of micro-organism.

In describing tuberculosis it becomes necessary to decide what it really is, and how it is to be distinguished from other diseases which resemble it.

As already stated, any deposits in the form of little lumps or nodules in the tissues or organs of animals were formerly de-

scribed as tuberculous ; but since the true nature of the affection has been made out, a definite meaning has been attached to the term tubercle by the scientific man, though to the practical man employed in the slaughter-house, conversant only with the naked-eye appearances, no such distinction is evident. It is therefore necessary to regard tubercle from these two points of view : the first, the practical every-day aspect which meets the eye of the slaughterman or ordinary observer ; and the second, the view which the pathologist and bacteriologist takes of it.

With reference, then, to the every-day aspect of tubercle, when an animal affected with this disease is slaughtered, the ordinary observer on looking at the diseased organs can see little solid masses raised above the general surface, and of a different colour to the structure in which they are deposited. In a dark-coloured organ like the liver they are easily seen, on account of their light yellow tint, but on the surface of the lungs they are not so readily recognised by sight, the contrast in colour being less marked. On passing the hand over the surface of these organs, the deposits, however, can often be readily felt where they are scarcely visible to the eye. On cutting into these diseased masses the knife often comes in contact with gritty material, the result of calcareous degeneration of the morbid deposit, while in others the little lumps are composed of a cheesy-looking mass, some portions of which may be semi-fluid. It is from this appearance that the terms *cheesy* or *caseous* have often been applied to these deposits.

Whatever may be the consistency of these tubercular deposits, whether cheesy or calcareous, they are always surrounded by a more or less dense fibrous case or envelope separating them from the adjoining tissue, but apparently not sufficient to arrest their growth, or prevent the extension of the morbid process. These caseous deposits, enclosed within a capsule, in the tissue of the lungs, liver, and other glandular structures, are not the only forms of the affection met with in cattle. A peculiar form is found on the surface of the lining membranes of the chest and abdomen, consisting of small lumps, varying in size from that of a pin's head to that of a cherry, or even at times larger. These are round or ovoid in shape, and hang from the surface of the membrane in clusters similar to bunches of grapes, or are spread over the surface like little granules. This grape-like arrangement of the deposits led to the application of the terms *grapy*, or *graped*, to animals affected with this form of the disease, which is often associated with the more diffused deposit in the interior of the lungs and other organs.

Tubercular deposits are not confined to the lungs and other

internal organs, but may be found in almost any part of the body when the infection has become general; thus, they may be found in the udders of cows in an advanced stage of the disease, sometimes in the lymphatic glands, beneath the lower jaw, and about the throat; more rarely in the interior of the bones, and still more rarely in the muscular tissue, or flesh. In the advanced stages of tuberculosis there is little difficulty in determining its existence, but in the early stages, when the deposit is limited in extent and confined to the lungs only, the diagnosis becomes extremely difficult, and the expert has to hesitate, because he knows that other morbid changes and products closely resemble tubercle and can only be distinguished from it by microscopic examination.

From the above it will be seen that, looking at tuberculosis from this practical and every-day aspect, there is often great difficulty in recognising its existence in the living animal, or even determining by the unaided eye its presence in the tissues or organs after death. In dealing with tuberculosis as a disease of animals, or with the question of the fitness or unfitness of the flesh or milk of tuberculous animals for human food, the practical view must always come first, and the experimental or bacteriological view follow as a means of confirming or correcting the evidence obtained from symptoms during life and appearances after death.

In reference to the pathological study of tuberculosis, the same may be said as about its history, that it has no well defined starting point. The experimental and bacteriological investigations date back only comparatively few years. In 1843 Klencke came to the conclusion that tuberculosis was due to a specific virus, was, in fact, a contagious disease; but it was not until 1865, when Villemin published the results of experiments which showed that this disease could be transmitted from man to animals by inoculation, that this view of its nature began to be generally adopted. Gerlach conducted a series of experiments, 1866-69, and confirmed the results of Villemin's previous investigation. These and other confirmatory experiments clearly demonstrated that the disease was an inoculable one. In 1869 Chauveau began a series of observations, with the object of ascertaining whether tuberculosis could be induced by feeding animals with tuberculous material, and also, if it was possible to produce the disease in animals by the inhalation of the dried and finely pulverised sputum of consumptive patients. From these experiments, which were of a very comprehensive nature, Chauveau came to the conclusions that the disease could readily be contracted by both ingestion and inhalation. M. St. Cyr,

of Lyons, in 1873-74 confirmed the conclusions previously arrived at by Chauveau. It had thus been proved experimentally that tubercle could be conveyed from man to animals, and from animal to animal, in three ways, viz: by inoculation, ingestion, and inhalation. In addition to these modes of inducing the disease experimentally, it had been for some time, as the result of practical experience, the opinion of medical men and breeders of stock that this affection was hereditary. Soon after the experiments referred to had been conducted a new departure was made in the methods of carrying out pathological investigations, and the cultivation in the laboratory of disease-producing micro-organisms began.

This led to our next great advance in the study of the disease, and Toussaint, in 1881, made the discovery that the virus could be cultivated apart from any animal body, but he was not aware at the time what the form or nature of that virus really was. In the following year Koch discovered in tubercular deposits the constant existence of a rod-shaped body which he considered the true cause of the disease, and named it the tubercle bacillus. Koch's discovery was inquired into and soon generally accepted. A method was thus established of determining whether any morbid deposit in the lungs or other organs of man or animals was tubercular in its nature or not. It is true that more recent and extended bacteriological investigations show that this tubercle bacillus of Koch cannot be distinguished at the present time by any of the known tests from the bacillus of leprosy, or from the bacillus recently described by Lingard in the affection known as lupus in the face of the human subject. But as these diseases are totally different in their ordinary clinical characters from tubercle, there is not much danger of their being confounded with it; and just as the microscope is the means of distinguishing between tubercle and other morbid deposits with similar appearances, so the naked-eye examination proves the means of distinguishing diseases with similar micro-organisms, but general clinical characters different from tubercle.

Prior to these experimental investigations and the discovery of the bacillus by Koch, tuberculosis was supposed to be due to various causes, among which may be mentioned climatic influences, defective nutrition, exposure to hardships, overwork, excessive secretion—in fact, any and every influence calculated to produce debility. Since Koch's discovery these alleged causes have been considered as only predisposing or preparing the structures of the body for the reception of the disease-producing germs which are the true cause. What

ever may be the part played by debilitating influences in the production or progress of tuberculosis, Dr. Ransome has recently shown that, among people in communities where such influences are general and continuous, consumption is far more prevalent than in others where such influences are not at work, and he explains that debility, induced by whatever cause, apparently renders the body more susceptible to the invasion of disease-producing organisms and likewise prepares it as a suitable soil, so to speak, for their proper growth and multiplication.

Heredity has always been looked upon as a cause of tuberculosis, but this has, as already stated, been the result of practical observation rather than of scientific inquiry. It is difficult to say in what way heredity operates as a cause of disease. It may possibly be on the generally accepted principle that like produces like, and in this case the consumptive offspring of consumptive parents is only an example of a general natural law. On the other hand, direct infection may occur before birth; the tubercle bacillus may be transferred from the parent to the foetus. Professor Johne, of Dresden, found in an eight-months' calf caseous nodules containing tubercle bacilli: it has also been said that the organism may be transferred to the ovum at the time of impregnation.

In connection with the question of the hereditary transmission of tubercle, breeding in and in has long been accepted as an important factor; but that view is no longer tenable in face of the evidence which can be furnished by well-known breeders of pedigree stock. Breeding in and in, so long as healthy stock are used, will never produce tuberculosis, but if tainted animals are used for the in-breeding, then the hereditary taint will be more and more intensified. Hence it is evident that the introduction of one tuberculous animal into a breeding herd may cause incalculable and almost irreparable mischief if not speedily discovered and the mistake corrected.

Until quite recently it was generally accepted, that of our domesticated animals cattle were the only victims of this disease, and, therefore, the only ones from which man might become affected through the use of their flesh as food; but it is now known that fowls are more frequently attacked than any other animals. Experiments have shown that rabbits and guinea-pigs are also very susceptible. Pigs are not uncommonly affected, sheep and goats are occasionally attacked, and the malady now appears to be more common in the horse than was suspected only two or three years ago. Carnivorous animals are comparatively free from any tendency to tubercular infection, but, although they evidently enjoy a considerable amount of im-

munity, still, cases are not altogether unknown among dogs and cats.

It may be inferred from what has already been stated that there is in many cases great difficulty in deciding whether an animal is the subject of tuberculosis or not. Animals—cattle in particular—may have tubercular deposits in their lungs and other organs, and still manifest all the appearances of perfect health. Butchers are now well aware of this, and in some legal proceedings instituted recently where tubercular carcasses were seized and destroyed, the purchasers produced proof that they bought the cattle as sound animals, and paid a price which they would only have given on condition, or in the belief, that they were healthy. They also showed that, as the beasts were in fine condition, they had no means of knowing that the disease existed until after slaughter, when the internal organs were examined and the carcasses seized. In other cases tuberculosis is marked by well-defined symptoms in its progress. These are, a cough which at first may not attract the owner's attention until the breathing becomes altered in character and laboured. Accompanying this cough, there is always a general unthrifty appearance, gradual emaciation (wasting), and an irregular or capricious appetite. There may sometimes be external manifestations of the disease visible, such as enlargement of the glands in the region of the throat, and, in the case of milch cows, hard nodular deposits may, in advanced cases, be found in the udder.

It has been suggested, to settle the question of the existence of tubercle in any particular animal while alive, that the mucus from the bronchial tubes collected from the back of the throat should be examined microscopically for tubercle bacilli. Also that the milk of cows suspected should be similarly examined, more especially if any nodules could be felt in the udder. Such examinations, when they reveal the existence of the bacilli, are no doubt conclusive; but in the majority of cases the absence of the bacillus in the specimens examined cannot be taken as proof that the disease does not exist. Thus, to settle the question, a post-mortem examination is absolutely necessary, and before the inquiry is completed a microscopic examination of the diseased organs may also be required.

The extent to which tuberculosis prevails among cattle in this country is unknown, as no attempt has hitherto been made to obtain reliable statistics. In large towns where there are public slaughter-houses, a record is kept of all carcasses seized and condemned as unfit for human food; but as every tuberculous carcass is not condemned the abattoir records are very imperfect

even as regards the animals slaughtered there. In addition to this it must be borne in mind that in these slaughter-houses the meat is subject to inspection; and it is only such animals as look healthy that are taken there. Animals, obviously tuberculous, wasters and piners, are disposed of in private slaughter-houses, where there is no inspection either of the carcass or of the internal organs. The meat, if firm and of good colour, is sent into a dead-meat market where it may be passed; or if the carcass is not sufficiently good for the open market, it may be disposed of in other ways on private premises. It is, therefore, evident that in this country, no reliable statistics as to the prevalence of tubercle in animals have ever been obtained.

In other countries it is much the same: thus, in Victoria, when the Tuberculosis Commission sat in 1884, the discrepant statements given in evidence before them by stock-owners and veterinary surgeons led them to continue their inquiry for another year, and obtain a return of all the tuberculous animals killed in the Melbourne Abattoirs. Although they obtained the number of carcasses in which tubercle was found there, it could not be accepted as any indication of the extent to which the disease existed among the cattle throughout the colony. The statistics collected in other countries are open to the same objections. Being merely slaughter-house records, they do not represent the condition of animals throughout the whole of a country.

It has been stated that, in some of the cowsheds and dairy yards of New York and Brooklyn, not less than half the cows are tuberculous, but no very clear confirmatory evidence of this has ever been adduced. The only point of value brought out in these slaughter-house statistics is the greater proportion or percentage of old animals (cows) affected with tubercle, as compared with young stock reared and fed for the butcher. In calves and young cattle not exceeding two years old comparatively few cases are to be seen, while in those from two to six years old the proportion is much greater, and in those over six years the percentage is still further increased. It is supposed by some that certain breeds of cattle are more liable to, and more frequently affected with, tuberculosis than others. This is a mere assumption. There is no breed of cattle in Great Britain in which this affection has not been found, and until we have an accurate census of the numbers of each breed, and are able to compare this with the number of cases of tubercle found in each, no conclusion of any value on this point can be arrived at.

The question has often been asked, how far and to what extent is tuberculosis contagious? Even at the present time,

although the disease has been produced experimentally by inoculation, inhalation, and ingestion, many people do not believe in its contagious nature—at least not in the ordinary sense. In the case of small-pox, scarlet fever, and other transmissible diseases, with a short and definite period of incubation, the date of the exposure to the risk of infection is often known and remembered; but in the case of a disease like tubercle, in which the earlier symptoms are not observed, or are ill-defined, and the progress is very slow, the time of exposure to infection cannot be so readily fixed. Many who admit that a man may catch small-pox, or scarlet fever, or an animal may take foot-and-mouth disease, from having been in contact with patients suffering from those affections, would laugh at the idea of either men or animals catching consumption.

Many cases are, however, recorded in the human subject, of consumptive patients infecting other people with whom they were in the habit of daily associating. It cannot be denied that such communication is possible; but experience indicates that it does not happen very often. In consumption-hospitals the nurses are daily and constantly exposed to the risk of infection in this way: the tubercle-bacillus has been found abundantly in the air of the hospital wards; but still, it is the exception to find the nurses fall victims to this disease. It must be admitted, therefore, that the infective power of consumption in man is very low, and unless the person exposed is predisposed either by heredity, unhealthy surroundings, or other debilitating influences, the infection is resisted, because the organism is not introduced into a suitable soil for its growth and reproduction. Were it otherwise, consumption would no doubt have steadily increased, whereas it has of late years considerably decreased.

In a similar manner the infective power of tubercle in animals is very low. Practical men consider that the affection is not readily communicable from one animal to another, even when they are in close association, as in the case of cows in town dairies. It may happen that one or two animals in a herd may be affected with tubercle and gradually waste until the owner either kills them and buries the carcass, or sells the animal to the jobber for about the value of the hide. Yet no apprehension is felt with regard to the rest of the herd, such as there would be had an animal affected with pleuro-pneumonia been brought into it. It may be argued that the stock-owner's opinion as to the infectious nature of a disease is not of much value; but it must be admitted that any man of long experience can give the results of his own observations, and the evidence of practical men generally is to the effect that tubercle does not spread like other

contagious diseases. An examination of cattle in a herd in which a tuberculous cow has been kept for many months, or even a couple of years, usually fails to detect any appearance of the disease in the animals associated with it. In cattle as well as in man the surrounding circumstances have often much to do with the extension of the disease.

The ingestion of tubercular matter by animals has proved the means of inducing the disease, and from this the question naturally arises whether the flesh or milk of all tuberculous animals should be condemned as dangerous and unfit for human food. There is great diversity of opinion on this point, for, while some maintain that the flesh and milk of all such animals should be destroyed, others hold that if the lesions are localised and confined to the lungs the meat and milk may be used without danger. It is true that the deposits of tubercle are seldom found in the meat, and the feeding experiments have proved that even in the advanced stages of the malady, when the milk proved infective to guinea-pigs and rabbits, the flesh in the raw state was harmless.

Meat is always cooked before being used as human food, and it has been demonstrated by Koch, Lingard, and others that a boiling temperature for a few minutes is sufficient to destroy the vitality and infective power of the bacillus; but milk is generally used as food without cooking, more especially in the case of children.

Tuberculous milk must therefore be looked upon as dangerous and likely to be the means of producing the disease in young or weakly subjects consuming it. The chief difficulty in determining whether the milk of any particular cow or cows is dangerous lies in the inability of the veterinary surgeon to say whether there are any tubercular deposits in the udder. Milk may contain these organisms and even a skilled bacteriologist fail to find them; their absence in the few drops which he examines is no guarantee that they may not exist. Recent experiments in America have demonstrated that where tuberculous cows showed no signs of the disease in the udder their milk proved infective to rabbits and guinea-pigs fed with it. The results of the feeding experiments all tend to prove that the milk from tuberculous cows, if given to animals in the uncooked state, possesses a very much higher infective power than the flesh.

The question whether legislation for this disease in Great Britain is necessary, and if so, what form it should take, has recently given rise to much discussion. Before, however, entering on this part of the subject it may be as well to notice the

legislative measures enacted at various times in other countries. The object of the laws passed in different countries in reference to tubercle has been the protection and preservation of the public health rather than the prevention of the disease among animals. The earliest laws relating to the consumption of the flesh of diseased animals were those of Moses, and they had reference to diseased conditions generally and not to any particular form of disease. The same was the case among the Romans; it was the duty of the masters of markets (*ædiles*) to see that all bad and corrupt meat was thrown into the Tiber. In the tenth century a Church law was passed forbidding the consumption of diseased meat.

The ancient laws of several continental countries, such as Italy, France, Spain, and Germany, forbade the use of diseased meat generally. The death of twelve people was recorded by Zückert in 1775, from eating the flesh of cows the viscera of which were covered with vesicles, tubercular nodules, and purulent tumours. Although the expression tubercular nodules was used in this instance, it does not by any means follow that the diseased conditions were the same as we now designate tubercle. In Austria, South Germany, Switzerland, as well as in Belgium and France, the flesh of tuberculous animals has always been more or less prohibited as food, but in practice it would appear that it has generally been only the carcasses with extensive lesions that have been condemned. A law of Germany, in 1732, imposed a penalty of fifty *rix thalers*, and, in aggravated cases, the addition of corporal punishment, not only for the sale of such diseased meat, but also for evading its inspection.

In 1810 France began to abolish all private slaughter-houses in large and medium-sized cities, and to establish public abattoirs where efficient inspection of all animals slaughtered for human food could be conducted. In many other continental cities a similar plan has been adopted.

In 1875 the Veterinary Council of Germany, and again in 1878 the Berlin Veterinary School, reported with great reserve on the question of the use of the flesh of tuberculous animals as food. At that time, and even now, opinion is very much divided as to whether the meat of all tuberculous animals should be condemned, or only that of animals in which the disease has spread from the primary lesion to other and distant organs. At the Veterinary Congress held in Brussels in 1884 the subject was discussed, and the conclusions arrived at were that the flesh and viscera of a tuberculous animal should only be utilised for food in the early stage of the disease, when the lesions are confined to a small portion of the body, when the lymphatic

glands are free and no softening of the tubercular deposits has taken place, and when the animal is in a good state of nutrition.

The result of the inquiry into the existence and extent of tuberculosis in Victoria in 1884-85 was that, while the Board considered the flesh of some tuberculous animals should be condemned, that of others less extensively diseased might be allowed to pass into consumption. They also came to the conclusion that the milk of tuberculous cows must be regarded as infective when the udder is involved or when the disease is generalised throughout the body. The Board recommended that tuberculosis in cattle should be declared by the Governor in Council to be a contagious or infectious disease for the purposes of the Diseases in Stock Act of 1872; and that no compensation should be paid to owners for the compulsory slaughter of tuberculous cattle.

In 1887 a decree was passed in France including tuberculosis in cattle among the contagious diseases under regulation in that country. France is, however, the only country in which tuberculosis has been legislated for as a disease of animals, and there only to the extent of isolating tuberculous cattle and placing them under supervision. Restriction on their movement is provided for, so that they can only be taken to a slaughter-house. If found in a fair or market, the tuberculous animal is not seized and destroyed, but may, at the owner's request, be taken back to the commune whence it came, or, if the owner prefer it, the animal may be slaughtered in the place where the fair is held.

It has frequently within the past few years been urged on our Government, by local authorities and medical officers, that tuberculosis should be included in the list of diseases within the meaning of the Contagious Diseases (Animals) Acts. These representations have always been made in the interest of public health, based on the plea that tuberculous meat and milk were dangerous if consumed as food.

In 1888 a Departmental Committee under the chairmanship of Sir Jacob Wilson was appointed by the Privy Council to inquire into pleuro-pneumonia and tuberculosis in cattle in this country. After hearing evidence with regard to the latter from medical officers of health, scientists, veterinary surgeons, and stock-owners, the Committee arrived at the conclusion that tuberculosis should be included as a disease under certain sections of the Acts, so as to provide:—

(a.) For the slaughter of diseased animals, when found diseased on the owner's premises.

(b.) For the payment of compensation for the slaughter of such animals.

(c.) For the seizure and slaughter of diseased animals exposed in fairs, markets, &c., and during transit.

(d.) For the seizure and slaughter of diseased foreign animals at the place of landing in this country.

One member of the Committee (Professor Horsley) sent in a supplementary Report, in which he recommended that breeding from tuberculous animals should be prohibited, and also that the notification of the existence of the disease should be made compulsory on stock-owners, and the neglect to give such notice be made a punishable offence.

The difficulties in the way of dealing with tuberculosis under the Contagious Diseases (Animals) Acts recommended by the Committee, are very plainly and clearly set forth by Professor Brown in the Annual Report of the Agricultural Department of the Privy Council for 1888, in the following terms:—

“Tuberculosis is in many cases extremely difficult to detect, and therefore a number of diseased animals would probably altogether escape notice. Further, there are several common affections from which cattle suffer, which are constantly mistaken for tuberculosis, and which are usually considered of a tuberculous nature. Should an Order be passed to deal with tuberculosis, it is quite certain that numbers of cases of actinomycosis and other diseases, as well as of animals suffering from debility as the result of starvation, would be reported as tuberculosis, and the animals suffering from these affections would be seized and slaughtered.

“Nor do the difficulties end here. Tuberculosis is known to exist in certain pedigree herds, and many valuable animals would fall under suspicion which could only be verified or proved to be false by the test of a post-mortem examination. In such cases the inspector would find himself on the horns of a dilemma. He would be forced to slaughter an animal worth some hundreds or perhaps thousands of pounds on a suspicion which might prove to be baseless; or he must keep the suspicion to himself and let the animal alone.

“Compensation presents another difficulty not easily disposed of. The Act of 1878 provides that compensation for diseased animals slaughtered shall be a proportion of the value of the animal immediately before it became diseased, i.e. when it was healthy. An old consumptive cow in the state of a ‘piner’ or ‘waster’ would not be worth more than the value of its hide when slaughtered, while in its original healthy state it might have been worth a considerable sum.

“Compensation for valuable pedigree cattle would certainly form a point of contention between owners and local authorities in every case where the slaughter of a valuable animal was ordered.

“In the present state of the law affecting the landing and disposal of foreign animals, the inclusion of tuberculosis in the list of diseases within the provisions of the Contagious Diseases (Animals) Acts would lead to complications which no scheme that has yet been devised will rectify, and, having regard to all the circumstances which have been referred to, their Lordships did not deem it expedient to pass the Order of Council which had been prepared on the lines of the Departmental Committee's Report.

Legislation for tuberculosis must be considered from two different points of view:

1. In the interest of the public health, restricting or pro-

hibiting the use of tuberculous meat and milk as human food.

2. Dealing with it as a contagious disease of animals, and adopting suppressive measures to eradicate it from the country.

In dealing with the first part of the question it would be necessary for the Government to lay down some fixed, clear, and definite code of instructions for the guidance of sanitary authorities and meat inspectors. Until, however, the members of the medical and veterinary professions hold more uniform opinions as to passing or condemning the flesh of tuberculous animals, it is not likely that any such instructions will be drawn up. In a recent trial at Glasgow arising out of the seizure by the sanitary inspector of some carcasses of cattle affected with tubercle, medical officers of health and veterinary surgeons gave evidence and expressed directly opposite views as to whether the carcasses in question were fit for human food or not. While such conflicting opinions are held by different professional men, there can be no uniformity of action. The result would be that meat which would be condemned in one place might be passed in another, and the bulk of the doubtful-looking meat would be sent where the inspection was least rigid.

Another difficulty in the way of obtaining uniformity of action in dealing with tuberculous meat is, that in this country we have very few public abattoirs where efficient inspection can be carried out. A large proportion of the meat consumed is killed and dressed in private slaughter-houses, or imported, and sent into the large wholesale meat markets. The carcass of an animal in the earlier stages of tuberculosis would when dressed probably show no evidence of the disease, and would therefore be passed as dead meat, whereas if the inspector had seen the condition of the internal organs he might have hesitated to pass it or even condemned it.

In connection with the question of the use of tuberculous meat and milk, the United Association of Municipal Corporations a few years ago sent out a series of questions to medical officers soliciting replies giving their opinions as to the infectiveness of such meat. The Association obtained very conflicting evidence. While some considered it highly dangerous others did not, and many gave no opinion at all. The Association also referred the subject to their Law Committee, who expressed the opinion that under Sections 116 and 117 of the Public Health Act of 1875, Health Officers and Sanitary Inspectors had sufficient power to seize and deal with tuberculous meat; but they considered it desirable that tuberculosis should be included as a contagious disease of animals, chiefly with the object of enabling Sanitary

Authorities to deal with tuberculous cows kept in dairies for the production of milk sold to the public.

Considerable excitement and alarm have recently been created in the meat trade by the action of some Local Authorities in confiscating the carcasses of animals as tuberculous and unfit for human food, where no suspicion of the disease existed while the animal was alive, and the butcher had paid a fair market-price, for which he supposed he was buying a healthy animal. At the present time there is no provision by which the butcher can be recouped for such losses, and in at least two actions brought against the sellers recently, the legal decision was against the butcher on the plea that no warranty was given.

It would be an exceedingly difficult matter to arrange for compensation to the butcher in such cases. It might be argued that, as these tuberculous carcasses are condemned and destroyed in the interests of the public health, the ratepayers of the district in which they are seized should pay; but this would naturally lead to such animals or carcasses being sent to the districts in which the compensation was awarded on the most liberal scale. On the other hand, it has been suggested that the seller of the animal—and that would mean the farmer or stock-owner from whose premises it had originally come—should bear a part, if not the whole, of the loss. Were this to be adopted it would imply a complete reform and reorganisation of the cattle trade. In many cases it would be utterly impossible to trace the animal back to the farm from which it came; and even if it were traced, would the farmer who had kept it and fed it, for say three months, sustain the loss, and the breeder or dealer who sold it to him escape?

On the Continent—in Denmark, for example—the butchers have a kind of a mutual assurance association in which every animal has to be insured before it is killed, and from which compensation—partial or total—is paid if the animal when killed is found by the inspector to be diseased. It has been suggested that something of the same kind should be done in this country, part of the fund to be supplied from the Treasury.

With regard to the question of the milk from tuberculous cows, the great difficulty lies in not being able to determine with any degree of certainty whether any particular cow is tuberculous. Even if that could be settled, there is the further question whether the milk contains the tubercle bacillus and is infective or not. If greater powers were conferred on Health Officers and Sanitary Inspectors in dealing with cows in dairies, more especially with such as might from their emaciated condition be suspected of being tuberculous, they would no doubt have

the effect of getting rid of such animals from all dairies and cowsheds regularly and efficiently inspected.

Such powers, if granted, might be exercised in a very arbitrary and oppressive manner. While the cowkeeper in large towns would be under strict supervision as to the health of his stock, the dairy farmer in rural districts, who sends his milk into towns for sale many miles off, would not be subject to such surveillance, unless powers were conferred on health officials where the milk is sold enabling them to enter premises in the district of other local authorities and to inspect the cattle. Such powers are not likely to be granted, and, even if they were, unless supplemented with power to deal with suspected animals in the district of another local authority, they would be comparatively useless.

The difficulties in the way of legislation for tuberculosis in the living animal are sufficiently obvious to cause considerable hesitation in dealing with this side of the question. They are chiefly, as expressed by Professor Brown in the report above referred to, the difficulty of diagnosing the existence of the disease and distinguishing it from others resembling it, and the question of compensation. In France, the only country in which it is treated as a disease of animals, there is no compulsory slaughter, and therefore no compensation. The tuberculous animal is isolated and placed under restrictions so that it can only be moved to a slaughter-house, and, when slaughtered, if the meat is considered unfit for human food it is destroyed and the owner may utilise the skin after disinfection by the inspector.

If legislation for tuberculosis in the living animal is adopted, the orders and regulations applicable to home-bred stock would have to be strictly enforced with regard to imported animals. It has already been shown how difficult the diagnosis of this disease is, and it would be throwing an undue amount of responsibility on inspectors at the ports, where foreign animals not subject to slaughter are landed, were they expected to detect all cases of tubercle in the short time they have for the examination.

Under these circumstances, if legislation for tuberculosis is carried out in home-bred stock, it will be absolutely necessary to prohibit the importation of cattle except for slaughter, because the disease is known to exist in the countries from which cattle are at present imported into this country.

Until some solution is arrived at in connection with the question of tuberculous meat and milk being used as food, there seems little probability that anything will be done as regards the disease in the living animal.

W. DUGUID,

FIFTY YEARS OF HOP FARMING.

IN 1870 it was stated of hop planters in this Journal that they "are now generally making vigorous efforts to improve their system of cultivation and management, so that it may be said that in no previous decade in the history of hop-growing has such intelligent attention been paid both to the scientific and practical phase of the question as in the years from 1860 to 1870."¹

Since 1870 there has been further improvement in systems of cultivation and methods of management, equal to that which has taken place in other branches of agriculture, and looking back to 1840 it will be seen that great progress has been made in the past fifty years of hop farming in every detail connected with the production of hops.

This progress, however, has not brought in its wake prosperity to the planters, who as a body groan under the burden of agricultural depression in common with the cultivators of most other crops, and, perhaps, with more vehemence, as the expenses of hop cultivation are very great and the losses proportionately high. But hop cultivation always was more or less risky and speculative, on account of the delicacy of the hop plant and its liability to affections of insect and fungoid nature, together with the vagaries of a market liable to "rings" and "corners," whose price fluctuations are sharp, sudden, and sometimes astounding.

THE HISTORY OF HOPS.

Before an account is given of the principal improvements that have taken place in hop cultivation and management during the last fifty years, it will be interesting to trace rapidly the history of hops in this country from the earliest date, which seems to be about the beginning of the sixteenth century. According to an old couplet,

Hops, Reformation, Bays, and Beer,
Came into England all in one year.

Another has it that,

Turkeys, Carp, Hops, Piccarel, and Beer,
Came all to England in one year.

There are records proving that there was a hop garden at Bourne near Canterbury in the reign of Queen Elizabeth, and

¹ "On Recent Improvements in the Cultivation and Management of Hops." By Charles Whitehead. *Journal of the Royal Agricultural Society of England*, Vol. VI., Second Series (1876).

hops are mentioned in the English statutes in 1552, in which year some privileges were granted to "hop grounds."

Even in these early days hop planting was held to be profitable, as shown in a work upon the subject believed to be the first ever published, by Reynolde Scott, entitled *A Perfite Platforme of a Hoppe Garden and necessarie instructions for the making and maintenance thereof, with notes and rules for reformation of abuses commonly practised therein, very necessarie and expedient for all men who have in any wise to do with Hoppes*.¹ In this curious and valuable little book it is stated that "one acre of ground and the third part of one man's labour, with small cost beside, shall yealde unto him that ordereth the same well fortie marks yearly, and that for ever."

Gervase Markham has a chapter in his *Way to get Wealth*, published in 1668, upon "The Inriching of all manner of barren ground and so to make it fruitfull to bear Hopps;" and R. Bradley, "Professor of the University of Cambridge and F.R.S.," published in 1729 a quaint little work *Riches of a Hop-Garden Explained*. He says in this, "For even ground that was never before esteemed worth a shilling an acre per annum is rendered worth forty, fifty, or sometimes more Pounds a year by planting Hops judiciously upon it." He adds, "I have known Hop-grounds that have cleared above 50*l.* yearly per acre to be sold at the first hand."

Thomas Tusser, "gentleman," who wrote *Five Hundred Points of Good Husbandry*, in 1557, describes the best soils for hops and advocates their cultivation in his peculiar poetry.

In the *Annals of Agriculture*, by Arthur Young, published from 1783 to 1805, several accounts appear concerning hop cultivation, and estimates are given of the expense of producing hops which will be quoted later on.

Marshall, also, in the *Rural Economy of the Southern Counties*, gives much interesting matter as to hops in Hants, Kent, Surrey, and Sussex.

HOP-PRODUCING COUNTIES.

The principal hop-producing counties have been from time immemorial Hants, Hereford, Kent, Surrey, Sussex, and Worcester, with respective acreages varying according to the state of the hop trade. In these six counties there has been a comparatively large permanent acreage, while in sixteen or seventeen other counties hops have been tried from time to time :

¹ "Imprinted in London by Henrie Denham, dwelling in Paternoster Rowe, at the Signe of the Starre, 1576: dedicated to the Right Worshipfull Mayster William Lovelace, Esquire, Sergeaunt at the Lawe."

but in none of these has the number of acres exceeded 600 during the last fifty years. For some time there were from 300 to 400 acres of hop land in Nottinghamshire in what was known by the Inland Revenue officials as the North Crays district.¹ Arthur Young states that there were about 200 acres of land planted with hops in Suffolk in 1782. This acreage was maintained up to 1840, and at one time was nearly equal to 600 acres, but since then it has gradually decreased. At the present time there are only twenty-nine acres in Suffolk. About seventy years ago there was a movement to make hop plantations in Essex, whose soil and climate were thought to be congenial for the growth of hops. At no time, however, was the acreage in any way important, and now the cultivation has entirely ceased.

The acreage of hop-land in Shropshire has varied within the last fifty years from 60 to 110 acres; in Berks from 30 to 10 acres; in Gloucestershire from 50 to 4 acres, its present acreage. With regard to the other counties where hop-growing has been tried, their acreages of hop-land have never exceeded thirty acres.

THE ACREAGE OF HOP-LAND.

According to the Agricultural Returns for 1889, the acreage of hop-land in the various hop-producing counties was as follows:—

County	Acreage in 1839	County	Acreage in 1889
KENT	35,487	SALOP	101
BERKS	10	SUFFOLK	29
GLOUCESTER	4	SURREY	2,101
HANTS	2,905	SUSSEX	7,282
HEREFORD	6,850	WORCESTER	2,939
NOTTS	16		
			57,724

There have always been great and somewhat sudden fluctuations in the acreage of hop-land, on account of the precarious character of this crop. At the beginning of the eighteenth century there were about 11,000 acres in the United Kingdom planted with hops. By 1750 the number of acres had reached 17,000. In 1775 there were close upon 21,000 acres. At the beginning of the present century there were 35,000 acres, and the acreage varied between this number and 56,000 acres during the following forty years. Fifty years ago there were only

¹ "Beastwood Flat in Askham, Nottinghamshire, is considered the flower of the North Crays, where often 20 cwts. per acre were gathered."—*The Hop Farmer*, by E. J. Lance, 1838.

44,088 acres, which had increased to 57,757 acres in 1855, to be reduced by 10,000 acres in the next three years, in consequence of over-production and low prices.

The excise duty was taken off hops in 1862. From this time there was a rapid rise in the number of acres until 1878, when there were 71,789 acres, the largest acreage on record. For the next few years there were reductions of from 4,000 to 8,000 acres, but in 1885 there were again over 71,000 acres. Since then there has been a very great decrease. More than 12,000 acres were grubbed between 1885 and 1888, and, as is shown above, the acreage was only 57,724 in 1889, or lower than it has been since 1867. The Agricultural Returns for 1890 will, it is believed, not show a further decrease.

EXCISE DUTY.

The abolition of the excise duty on hops in 1862 gave a great impetus to hop planting. Taking the average of the whole hop plantations, this tax on the produce of the soil was equal to an annual charge of close upon 7*l.* per acre. It pressed very heavily upon planters in districts such as Sussex and the Weald of Kent, where the yield was large and the value of the hops low as compared with that of those grown in East and Mid Kent, and Farnham. It frequently happened that a planter had to pay as much as 15*l.* per acre for duty, while his hops did not make 3*l.* per cwt.

IMPORT DUTY.

The import duty upon hops was also taken off in 1862. Though this caused much larger importations into this country, these importations did not appreciably interfere with the demand for home-grown hops, as the acreage steadily increased until 1885. This increase was caused in a great degree by the very high prices of hops in 1882, on account of the short crop. The average price of English hops in the season of 1882-3 was 18*l.* 10*s.* per cwt., and some choice samples made 30*l.* per cwt., the highest price known for hops in this country. There also were exceedingly good times for hop planters between 1869 and 1875. Prices were remunerative in spite of large crops upon a largely increased home acreage and of large importations duty free.

Hops were on this account extensively planted. Common but prolific sorts were selected, and in many cases the land was not suitable for the production of samples of approved quality. After the heavy crops of 1883, 1884, 1885, and 1886, in which

last year 660,000 cwt. were grown, and the large importations of 1882, 1884, and 1885, together with the unfortunately low quality of the English hops caused by unpropitious weather, the mattock was used vigorously, and the acreage was reduced to what many think is about its normal and proper extent.

LIMITED EXTENT OF HOP-LAND.

It is believed that there is only a certain limited number of acres of land in England that will produce hops profitably. In the six principal hop-growing counties, the parishes in which hops are cultivated are pretty much the same now as they were in 1840, and even at a much earlier date. Their number has been increased in a very slight degree: as an instance of this, there were 290 parishes in Kent in which hops were grown at the commencement of this century. Now the number is 296. To go further, it might be said that in the hop-growing parishes in these six principal counties, the land planted with hops is now pretty much the same as it was fifty years ago. As a rule, other land which has been planted with hops in times of prosperity and high prices has been grubbed in periods of depression. In short, the "fittest" land has survived. For example, there were about 7,500 acres of hop-land in Sussex in the decade ending 1840. From 1872 to 1878 the acreage varied from 9,738 acres to 11,360. At this time there are only a little above 7,000 acres.

The hop districts of Herefordshire and Worcestershire are exceptional in having made and retained an important addition to their acreages since 1840. Then the extent of hop-land was 6,000 acres, now it is nearly 10,000 acres. This is because the quality of the hops has been better during the last few seasons than in other counties, and brewers have taken a fancy to "Worcesters," especially for "dry-hopping" purposes; and much improvement has recently taken place in their cultivation and management.

CHANGE AND PROGRESS.

There is, perhaps, no branch of agriculture in which so many changes have occurred and so much progress has been made during the last fifty years, as in hop culture. And this applies not only to the treatment of the soil, the selection of sorts, the use of manures and modes of preventing and remedying disorders caused by insects and fungi, to whose attacks the hop plant is eminently liable, but also to the preparation of the hops for market, in the methods of picking, drying, and packing.

SELECTION OF SORTS.

It has been patent to hop planters for some time, and especially within the past five years, that it does not pay to cultivate inferior and ordinary kinds of hops. Quality is more than ever demanded by brewers, who will have "coloury" samples with aroma and condition. If they cannot find these of English growth, they will take them from other countries. They give, however, the preference to English hops, as possessing, when produced in perfection, the desired combination of colour, active, "fixed," bitter principle, and strength, far above the hops of other climes.

In East Kent and Mid Kent, whose soil and surroundings suit the Golding hop,¹ this sort is largely cultivated, having when well grown a brewing value unsurpassed by any other kind. It has small filbert-shaped cones of a bright straw colour when ripe, which grow in bunches of three or four cones. This and the Bramling, a Golding variety of earlier habit, have in a degree superseded the Grapes, Jones, Colegates, and other common sorts grown to a considerable extent in these Kentish districts until the last ten years. During the palmy days of hop-growing, from 1860 to 1876, very prolific and early kinds of hops of most ordinary attributes were planted, such as Meophams, Prolifics, and Henhams. These are being fast eliminated from the best Kentish growths. Even the Grape, whose large cones grow in clusters, found frequently in many Mid-Kent plantations, has given place to Goldings and Bramlings and Fuggles. The last-named is somewhat coarser and of a less delicate nature than Goldings, yet with a good deal of Golding quality.

The Weald of Kent cannot produce Goldings profitably. Here early, heavy cropping varieties were planted when the times were good. There is a general tendency now again to displace these, as they are a drug in a well-supplied market. Grapes and Jones and Fuggles are chiefly relied on. The coarse, late, badly flavoured Colegate, so common here forty or fifty years ago, is fast being rooted out. A new variety, known as "Bates' Brewers," has been planted just lately. Sets were taken from a hill in a hop ground in a Weald of Kent parish, noticed as yielding hops of a peculiar habit and quality, and different from other plants in the ground.²

¹ Marshall, in his *Rural Economy of the Southern Counties*, says of this hop that "Mr. Golding, in the Malling quarter of this district, observing in his grounds a hill of extraordinary quality and productiveness, marked it, propagated from it, and furnished his neighbours with cuttings from its produce."

² Most of the best varieties of hops have been selected in this manner, and not produced from seed.

Attempts have been made to grow Goldings in Sussex, but without much success. At the same time there has been much improvement in respect of the general quality of the hops of this county. The Colegate, within the recollection of many persons, was the chief sort cultivated. Grapes and the Jones were also grown; these now predominate, having been considerably improved in important characteristics. Fuggles' "Bates' Brewers" have been tried latterly with much advantage in Sussex, as well as a variety known as Hobbs'. All these have Golding qualities in some respects. In no part of the hop-growing districts have greater endeavours been used to level up the hops to the changed requirements of the brewers than in Sussex.

Not much change has taken place in Hants and Surrey as to sorts, except that the more common kinds have been grubbed up in the best districts. The Whitebine, known as the Farnham Whitebine, or Williams' Whitebine, is the leading kind on the choice soils, and hops having Golding features are generally more cultivated.

There has been a considerable grubbing of low-class hops in Herefordshire and Worcestershire, especially within the last ten years, and upon the best land. Mathon's Whites, Bramlings, and Whitebine Goldings have been chiefly planted in their places, and a certain quantity of the Mayfield Grape, which is a valuable kind for picking late. It may be said that there has been more improvement in the condition, quality, and general appearance of the hop samples produced in these two counties within twenty-five years than in any other hop districts. This is owing in a degree, no doubt, to the selection of better sorts, as well as to improved management.

PLANTING.

Hop plants are not put so close together as in earlier periods, because it has been found that a larger return may be had *cæteris paribus* from, say 1,030 hills or plant-centres to an acre, than from 1,400. For the most part, the hills or plant-centres are now put 6 feet 6 inches apart, and planted "on the square," which would give 1,030 hills to the acre, or six feet apart, giving 1,210 hills to the acre.¹ This is better than planting triangularly, as was once the fashion, for purposes of culture, and what is more important still, for washing the plants when attacked by aphides, and for sulphuring them for mildew.

¹ In Worcestershire and Herefordshire, the plant-centres are in many cases put 7 feet apart each way, or only 889 to an acre.

Bedded sets—that is, sets that have been raised in a nursery—are invariably used for planting. Two strong sets are sufficient for each plant-centre. It was the practice to put four or five sets, cut off the stocks in the spring, directly into the ground to form new plant-centres. In dry seasons many of these died, and it has been found that bedded sets alone can be relied upon to secure an even plant.

MANURING.

It was firmly believed by former generations of hop planters that farmyard manure from bullocks fed upon oil-cake was the only fit and proper fertiliser for hop plants. Rags and sprats were used to some extent, but rich farmyard manure was the main resource. To produce this the planters' yards were well stocked with cattle, fattened regardless of expense. Long prices were given for choice store animals for this purpose at the autumn fairs. In Kent and Sussex steers of the Sussex breed were in great request, and huge Sussex oxen—seven or eight years old, drafted from the working teams or yokes—made long prices as consumers of almost unlimited quantities of cake.

Fattening cattle is comparatively but little practised now. London manure, and manure from towns, is brought in enormous quantities into the hop districts by rail, road, and river, and distributed by traction engines. This is held to be cheaper than home-made manure, and nearly as efficacious.

Rape-dust is now most extensively used in hop cultivation, being quick in action and at the same time of a fairly lasting nature. It is usually applied in June, put round the hills or plant-centres at the rate of from 8 to 15 cwt. per acre. Generally speaking, a winter dressing of London or farmyard manure, rags, sprats, shoddy, or fur-waste is given, and rape-dust is applied in the summer.

Shoddy, the refuse of cloth manufactories, has to some extent taken the place of rags. As this varies much in cost and quality, the amount of nitrogen in its composition ranging from 2 to 10 per cent., it is put on at from 1 to 2½ tons per acre, at a cost of from 35s. to 55s. per ton.

Fur-waste, from furriers' shops, is a manure that has come into vogue for hops within the last thirty years. "Rabbits' fur" manure, composed of the flick, feet and tails of rabbits, is a splendid dressing for hop-land. The price of this ranges from 5l. 5s. to 8l. per ton. When pure it is most efficacious, forcing the growth of the vines in an extraordinary degree.

Other refuse products from manufactories of different kinds

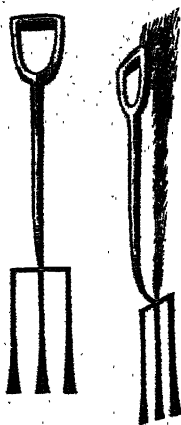
are utilised for hop manures, such as glue refuse, and sugar refuse. Mussels, sprats, and other fish are still employed, but not very extensively, as they are considered not to have much "stay" in them.

Artificial manures, as nitrate of soda and sulphate of ammonia, are chopped in round the hills at the rate of 2 to 3 cwt. per acre in dry seasons, and when the plants obviously require stimulating. About fifteen years back, some planters were in the habit of regularly forcing the bine in this way, with the effect of injuring the quality and "condition" of the hops.

CULTIVATION.

Though there have not been material changes in the modes of hop cultivation, it has been more systematically and thoroughly attended to by the present generation of planters. Digging the land with the four-pronged spud, figured below, is still usually adopted during the late autumn and winter months. Farmyard manure, rags, sprats, shoddy, and other fertilisers applied in winter are dug in by this operation. Ploughing with two horses sometimes takes the place of digging. This has been done more extensively in the last few years of depression, but as a rule it is an unsatisfactory process, and really not cheaper than digging.

Fig. 1.—The Spud.



After the poles have been put up, the nidgets, or large horse-hoes, are set to work, to tear up, mix, and pulverise the ground between the rows of poles. Two horses draw these at first until the tilth is fine. Afterwards one horse can work them easily. Nidgetting is done not only to kill the weeds springing up quickly and luxuriantly after every shower, but also to maintain a deep bed of triturerated soil, well aerated and sun-heated.

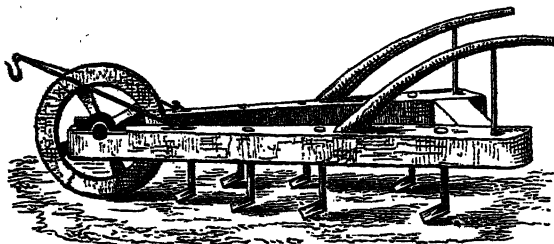
It is in these respects that the cultivation of hop-land has been vastly improved. In many hop grounds during the summer one can put the foot with the leg more than half-way up to the knee in the well-moved soil, and stir it about easily.

Suitable implements have been forthcoming to expedite modern requirements. A good collection of these appeared at the Royal Agricultural Society's Show at Wolverhampton in

1871, where prizes were first offered for hop implements and machines.¹

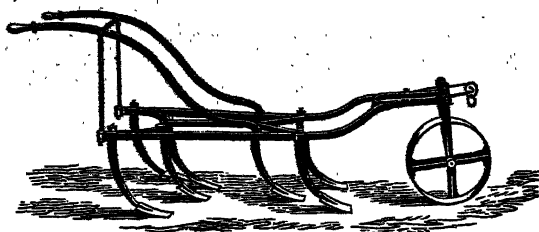
The difference between the old nidgett and that now in use will be seen by looking on this picture—

Fig. 2.—*The old Wooden Nidgett, or Shim.*



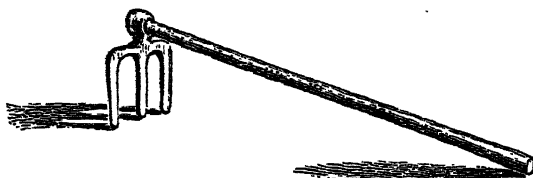
And on this.

Fig 3 —*The new Iron Nidgett, or Shim.*



There is a circle of ground round the plant-centres and their poles which cannot be touched by the nidgett. This is

Fig. 4.—*The Canterbury Hoe.*



dug with the spud directly after poling, and is hoed afterwards with the admirable tool known in Kent as the Canterbury hoe.

¹ "Report of the Judges on the Trials of Hop Machinery, and Miscellaneous Articles, at Wolverhampton," *Journal of the Royal Agricultural Society*, Vol. VII, Second Series, page 577.

Artificial manures to stimulate the plants are chopped in with the above described hoe in July, and sometimes even in August, if there are signs of flagging energy.

POLING.

Not so many poles are set to a plant-centre in these later times. It was the general custom to put three poles to Golding hop plants, and frequently four to Grapes and Jones. Now two good poles are often only put to Goldings, and very often one row of plants is poled with two poles, and the next with three poles, and so on. It is most exceptional to see hop plants now poled with four poles. The foliage gets massed on the top of the poles, and air and light cannot permeate. To prevent the accumulation of bine, the poles are pitched so that their tips may stand as far apart as possible.

Ash, chestnut, larch, fir, maple, willow, oak, red birch, alder, and beech poles, are chiefly used. An enormous saving in the cost of poling has been made by the practice of creosoting the ends of the poles that go into the ground. This has now been adopted generally since about 1860, and it is reckoned to have lessened the whole cost connected with poling hops by nearly 40 per cent. Poles are so cheap now on account of the diminution of the hop acreage, and the effect of creosoting, that planters in some few instances are reverting to the practice of putting up uncreosoted poles.

Creosoting has decreased the value of woodland considerably in Kent and Sussex. In these counties the "plantations" of ash and chestnut, made especially for furnishing hop-poles, coming to cut once in from eight to fifteen years, were worth from 25*l.* to 60*l.* per acre, at each "fall." Now they give only from 10*l.* to 25*l.* per acre at each fall, and even less. Ordinary woodland planted up for cutting for hop-poles has become depreciated at least 50 per cent. within the last ten years.

Besides the creosoting and the lessened demand for poles on account of the reduced hop acreage, several methods of training hop plants upon wires, and string made from cocoanut fibre, fastened to permanent uprights, have been introduced since 1860 and adopted somewhat extensively. The great advantage of these methods is that the wind has comparatively little effect upon the hop plants, while it very frequently causes indescribable injury to those trained in the ordinary way upon poles, especially in the latter part of August, when gales are chronic and the hops most liable to be damaged.

Cocoanut fibre string is also very largely used to carry bines

from pole to pole, instead of the ordinary poles put in as helpers, and to train weakly vines up until they are strong enough to make the turns to enable them to twine round their proper poles. In other ways this string is of the greatest service to hop planters for training.

TYING.

There has not been much change in the manner of tying hops¹ to the poles. Nothing better than the time-honoured rushes has been discovered for this purpose. More care is taken to pull out rank and forward vines before the tyers go to work, and far more attention is given to fastening the leading shoots to the ends of the poles when they have arrived there, in order to prevent the vines from slipping down. This is termed ladder-tying, as the tyers have to mount upon ladders. Hop-tying is, as a rule, done by women. Men are set on when the vines grow very rapidly.

ATTACKS OF INSECTS AND FUNGI.

Enemies of the hop plants have increased during the past fifty years in an even greater proportion than those of other plants. Modes of preventing their attacks and remedies against them have been devised of more effect and advantage than in most other cases, owing to the value of the crop, and the habit of growth and mode of cultivation of the plants, which facilitate the use of remedial measures.

Aphides are the worst foes of the hop planters. History shows that there have been periodic appearances of these insects ever since hop-growing was adopted in England. Before 1840 such visitations were not so frequent as in these later years. They were, however, far more disastrous, as no remedies, or, at least, no remedies of any efficacy, were known, so that the crop was often utterly ruined. Now, in ordinary circumstances, ordinary weather being given, the planters can rout this enemy by means of washing, or syringing, the infested plants with solutions noxious to insects.

In most seasons of the last decade aphides have appeared, and hop-washing has become almost a regular part of hop-cultivation.

Now that it has been demonstrated that the eggs of the Hop Aphis, *Phorodon humuli*, are laid upon the plum, damson, and other trees of the *Prunus* tribe, it is considered that the large

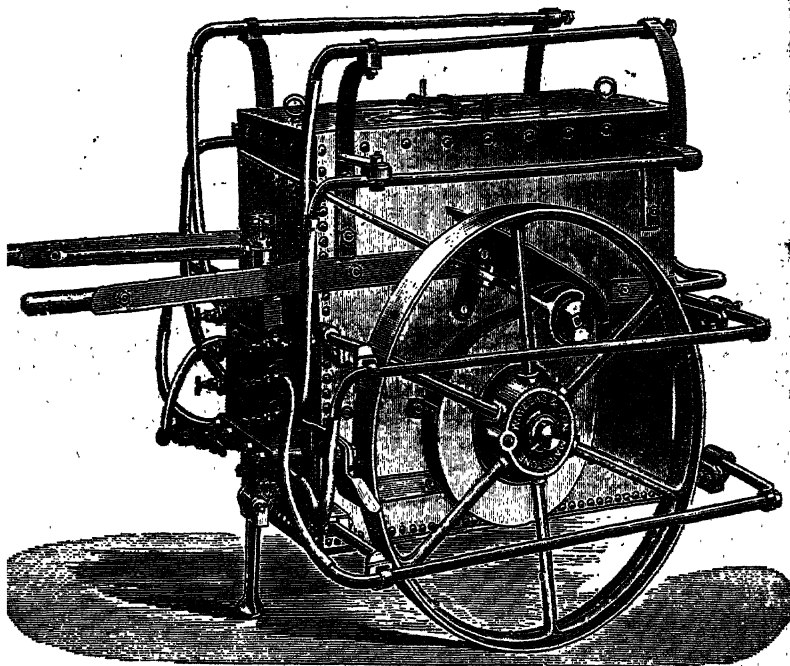
¹ It may be mentioned here that planters endeavour now to prevent the vine coming too early by "dressing" the plant-centres later. Vines that are early are apt to be injured by white frosts.

increase of damson trees in the hop-growing districts has caused the attacks of aphides to be more frequent and persistent.

For clearing the hop plants of aphides, hop-washing engines, which are enlarged garden engines with strong pumps, are used. These have a length of hose on either side fitted with spray jets, which are directed upon the hop plants by two men, while another man works at the pump.

On large plantations, washing-machines, as shown by Fig. 5 below, are drawn by horses between the rows of hop plants;

Fig. 5.—A Horse Hop-washing Machine.



these are fitted with rows of pipes perforated at proper intervals, which can be so adjusted that in all stages of growth the wash is forced by the pumps evenly over the plants.

Various washes are employed. Nothing has been found to be more efficacious than the extract of from seven to nine pounds of quassia chips with six to eight pounds of soft soap to 100 gallons of water.

Washing is a costly and tiresome process, since it is imperative that each leaf must be treated, as if only two or three

aphides are left upon the plants they will quickly produce legions to disseminate fresh mischief. If the operation of washing is commenced early and is well performed, and repeated when necessary, an aphid blight, which of old had such terrors, can be averted.

Red spiders, *Tetranychus telarius*, have appeared in hop plantations within the last twenty-five or thirty years. In some seasons, especially in a dry summer, they have done considerable harm. They are checked, in a degree, by washing with quassia and soft-soap solutions.

"Fleas," *Haltica humuli*, very similar to the turnip-flea beetle, or turnip "fly," are more numerous than in days of yore, and are to some extent routed by dressings of soot and lime.

Another comparatively new pest is the "Jumper," a species of the *Cercopidae* known as *Euacanthus interruptus*, which makes its appearance in June, and injures the plants by piercing the stems and sucking out their juices. Twenty-five years ago this insect was hardly known. Now it frequently does very much harm. It is circumvented by tarred boards being held near the poles, so that when these are tapped smartly the "Jumpers" take leaps into the tar.

There is yet another insect not known as injurious to hop-plants until the last twenty years, which also pierces the bines in many places, causing the sap to flow so much as to weaken the plants. It is a species of "plant-bug," described as *Lygus umbellatarum*. Against this attack but little can be done except by forcing injured plants with manure.

MOULD OR MILDEW,

caused by a fungus, is the most deadly and insidious enemy of hop-plants. Though this disorder was known at the beginning of the century, and even earlier, being termed "fen," it was, as it appears from Marshall,¹ principally prevalent in East and Mid-Kent. About fifty years ago mould chiefly affected Golding hops on certain Kentish soils. Within the last thirty years it has spread into all the hop-growing districts, though to a less extent in Worcestershire and Herefordshire than in the other counties.

The spread of this mildew coincided with that of other mildews, whose appearance in many countries was almost simultaneous. For instance, the potato mildew, the terrible *Phytophthora infestans*, was first seen in Europe in 1844. The vine mildew, *Oidium Tuckeri*, began to devastate the French and German vineyards about 1846. Since this date the coffee

mildew, *Hemileia vastatrix*, has appeared, and a mildew has caused considerable injury to fir woods and plantations in recent years. The more dangerous vine mildew, *Peronospora viticola*, which was no doubt imported from America, was first noticed in the departments of the Charentes about twenty years ago. It quickly invaded the whole of the European vineyards.

Since about 1850 the hop-planters have endeavoured to stay the ravages of mildew by means of sulphur dusted upon the plants. In some seasons this has certainly prevented the germs of the fungus from finding a congenial *nidus* upon the plants, and has checked their progress after they have become established.

Sulphur is the only remedy at present known in this country against this mildew. It is not always efficacious, as the disengagement of sulphurous acid, which is destructive to the fungus, only takes place in ¹ hot weather.

Sulphur, though efficacious to a certain extent as against the one vine mildew, *Oidium Tuckeri*, is not of much avail against the other more dangerous vine mildew, *Peronospora viticola*, for which sulphate of copper solutions appear to be the best remedies. It is strange that hop-planters have not tried this for the hop mildew.

Sulphur is applied by means of an ingenious machine drawn by a horse between the rows of plants. There is a fan within this which, being made to revolve quickly, distributes the finely-powdered particles of sulphur over the plants in quantities varying from 40 to 80 lb. per acre.

It was formerly thought best to do this at night, so that the sulphur might be fixed on the leaves by the dew. Now it is done in the daytime, and if possible during sunshine.

PICKING.

This operation is still solely performed by hand. An enterprising American brought a machine for hop-picking to this country about twenty years back, but it proved to be of no practical value.

The hops are better picked, on the whole, than formerly; but it must be said that there is room for further improvement, as the hops are frequently picked in bunches, and too many leaves and branches are allowed to fall into the picking bins and baskets. Brewers are more particular now than in the old days, when much rubbish was stowed away in "bags" to be

¹ *Guide du Soufreur de Vignes.* Par M. E. la Vergne. *Mémoire sur la Maladie de la Vigne.* Par M. Marès.

used for porter, according to tradition. Some planters are most careful as to the picking, and pay a better price to have the hops picked singly and as far as possible without leaves and branches.

In Kent and parts of Sussex the hop-picking is a fine harvest for thousands of immigrants from the slums of London. As many as from 40,000 to 50,000 "strangers" come into Kent to pick hops in good seasons. Very fair accommodation is provided for these now. In former times they were housed in heads of barns, lodges, and extemporised quarters made of thatched hurdles and sheep-gates, and were huddled together like pigs. On most hop-farms now there are substantial "hopper houses" built of brick and tile, or brick and corrugated iron, with cooking-houses. In parts of the Worcestershire and Herefordshire hop-plantations, hop-pickers come from large towns near.

DRYING.

During the last fifty years great improvement has been made in the management of hops, that is, in their treatment after they have been picked. In the first place, the picking only lasts now from sixteen days to three weeks; while in the "good old days," as the pickers lament, it lasted frequently from five to six weeks. Consequently the later pickings were brown from exposure to the weather, and often blackened within the cones by aphides. These brown and diseased hops were saleable for porter-brewing. There was no foreign competition. Now, hops of this description are practically unsaleable. Every planter hastens to get his hops picked in the shortest possible time. This of course entails many more pickers and more enlarged kiln accommodation, which is now available upon most hop-farms. At the same time there has not been a corresponding increase of cooling-room space, as the dried hops are packed at once while warm. It was the practice to let the hops lie cooling for several days before they were packed, as it was considered that this gave them weight. But their aroma escaped, and much moisture was taken up, to the detriment of their keeping qualities. In these circumstances it was necessary that the hops should be fully dried—"home dried"—or they would not keep. This frequently entailed a loss of valuable properties. If hops are packed at once and while they are warm, they need not be so thoroughly desiccated.

Much more judgment is used now, and more pains are taken in drying hops; but there is room for further considerable improvement. Thermometers are occasionally employed to en-

able the dryers to regulate the temperature. These were not dreamed of by the last generation of planters. Old cockle-kilns have disappeared, even in the remotest parts of the "Wild" of Kent and Sussex. Patent methods of drying have been adopted by a few planters; but the ordinary mode is to dry the hops in a circular or square kiln, duly capped by a cowl to carry off the reek.

The circular kilns, which are the most common, are from 18 to 20 feet in diameter. At from 13 to 16 feet from the ground joists are introduced, from which a sharply-sloping roof begins. From this point to the cowl-capped top it is from 15 to 18 feet in height. Upon the joists horsehair cloth is stretched, where the hops are laid. Below there are either open stoves, or fire-places are set in brickwork and enclosed that the heat may be more concentrated upon the hops above.

The hops are not laid so thickly upon the kilns in these days. There is not, therefore, so much moving them about and turning them over required while they are drying, and the work is completed in less time. It was formerly, in many cases, a kind of stewing process instead of a gradual desiccation as it should be, and as it is at present in the best-regulated "oast"-houses.

Thus the hops come off the kiln more whole, and with much less loss of their valuable properties and essences. Being packed up at once, they do not waste their freshness in the air of the cooling-rooms. While there has been improvement generally in hop-drying, taking the country throughout, the process is not conducted upon scientific principles, and brewers complain frequently of the indifferent management of hops, entailing loss of essential properties, and causing them to keep badly. There has been, perhaps, more improvement in management in Worcestershire and Herefordshire than in other parts of England, which makes hops from those counties particularly acceptable to brewers.

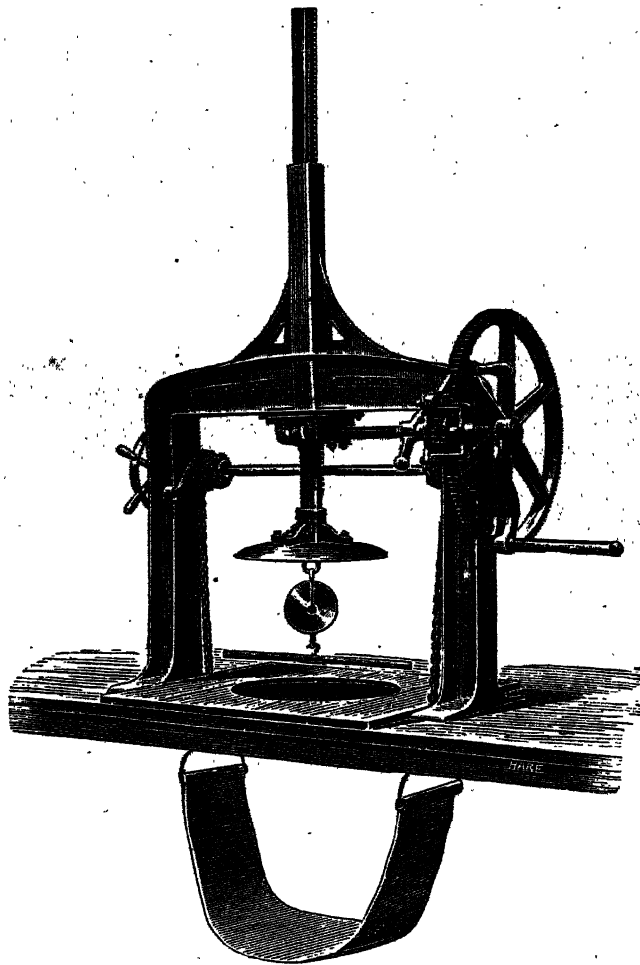
PACKING.

In no branch of hop management has such radical alterations been made as in packing. They were in old times put into bags and into pockets. The former were 7 feet 6 inches long and 4 feet wide, of material nearly an inch in thickness, made of hemp, hay, and tow woven together. About 2 cwt. were put into these, especially brown, diseased, and inferior qualities. "Brown bags" formed the tail-end of most growths.

Pockets are now alone used; they are between 6 and 7 feet long and 3 feet wide, holding $1\frac{1}{2}$ cwt., and being made of coarse

canvas. Planters are particular to get bright, heavy qualities of "pocketing" to preserve the hops, that the pockets may look well.

Fig. 6.—*A Hop-pressing Machine.*



Hops were originally packed by men jumping in the bags and pockets suspended in mid-air from the cooling-floors. This was a very laborious and thirsty operation. It has been utterly superseded by pressing-machines, whose even action prevents the disintegration of the cones, and puts the hops together

regularly and closely. Much saving of time and labour has been effected by these machines, an illustration of one of the most modern of which is given above.

STORING.

It has been found out by bitter experience that hops cannot be kept long in the store-rooms and other buildings upon farms. A damp atmosphere and variations of temperature cause the formation of a "crust" of mouldy and decaying particles under the "pocketing," which gradually extends deep into the contents of the pocket. When the hops are sold, and examined for weighing, all this "crust" is cut away and rejected by the purchaser. Planters, therefore, in these days very rarely keep hops at home, unless they have exceptional accommodation. They send them directly they are picked to the warehouses of the hop-factors in London, where they can be well kept, even for years.

METHODS OF SELLING HOPS.

Not very much alteration has taken place with regard to the methods of selling hops in the last fifty years. It is the custom now, as formerly, to sell whole growths in one transaction, and, as a rule, through an intermediary agent, or factor, who sells the hops, not to the brewer—the consumer—direct, but to a merchant, who supplies the brewer as he requires them. It is exceptional for a brewer to purchase hops of the producer or the factor. Merchants buy of the producers occasionally, and this practice has been somewhat extended lately; but the great bulk of the hop-crop passes through the hands of factors and merchants. Attempts have been made to bring the producers and consumers together. The formation of companies has been attempted, to take the place of factors, and to make advances to the planters as they do; also to take the place of merchants, and hold the hops for the brewers, and give them time for payment as the merchants now arrange.

It will be easily understood that the present system is essentially wrong, as the greater part of the year's crop is put upon the market at once directly after it has been picked, and often before the consumers are in the market. There is no absolute value determined at this time, at least not that fixed by actual supply and demand. The planters press to sell. The factors wish to sell to cover advances. The merchants buy, it is true, to some extent upon speculation, but for the most part

at the advantage which a small band of capitalists has over a large, disunited body of producers wanting money. The brewers have to take the hops at a price which gives a profit to the merchants. Sometimes big profits are made, though since the importations of hops have been large the merchants have not been able to govern values to any great extent. Indeed, in one or two years, when the home-crop has been of indifferent quality, and the probable importation uncertain, the merchants have in some instances obtained offers from brewers for hops still belonging to planters, whose samples were lent by the factors.

In a season like that of 1889, when a crop of average quantity and good quality is grown, the merchants do not hesitate to purchase freely, as they know that the brewers will have fine English hops in preference to any of foreign origin.

Unfortunately, in almost all instances farmers are mulcted directly and indirectly by the charges and intermediate profits of middlemen in the disposal of their produce. Hop-growers are worse off than any other producers under the sun in this respect. The mode of sale of hops is costly, antiquated, and is one of the reasons why hop-growing in England is in a depressed condition.

In former times there was a large hop-fair held at Weyhill, in Hants. Hops from the Hants and Surrey plantations were taken and pitched there for sale in whole growths. Some thousands of pockets were sent to this fair in good seasons. The hop-fair was divided into the "Farnham Row," for the hops produced in the celebrated Farnham district, and the "Country Row," for Hants hops and those grown in other parts of Surrey. More recently the planters have sent the ordinary samples of their growths, or sample pockets. In 1889 there were only 518 pockets pitched in the "Farnham Row." The business done in hops at Weyhill Fair is now, comparatively speaking, very small. The greater part of the hops, at least from Kent, Sussex, Surrey, and Hants, is consigned for sale to the Borough, the great hop-emporium of the world.

There was a hop-fair at Maidstone and other Kentish towns where hops were sold by sample; also at Robertsbridge, in Sussex. These now exist only in name. No hops are sold there.

At Worcester there is a special building used as a hop-market, where the principal part of the hops is sold and weighed, the record of the number of pockets which pass the scales being duly reported in the papers. Some of the hops are brought into the market warehouses, and sampled and sold to merchants by the owners. In many cases Worcestershire and Hereford-

shire hops are sold to the merchants by the owners. A few are sold by factors.

PRICES.

The variation in the prices of hops has always been extreme and peculiar, and as much so before the home and foreign duties were abolished as since their abolition. Thus, in 1817 the average price was 23*l.* per cwt., and in 1820 only 4*l.* 4*s.* per cwt. In 1847 and 1848 the average prices were respectively 3*l.* 10*s.* and 2*l.* 15*s.* per cwt.; while in 1854 the average was 20*l.* per cwt.

Taking the last twenty-eight years—the period since the repeal of the hop duties—the annual average price of hops has been 6*l.* 7*s.* 6*d.* per cwt. This includes the high average price of 18*l.* 10*s.* made in 1882.

Comparing this with the annual average price of hops for the twenty-eight years ending 1854, it is found that this was 6*l.* 17*s.* 6*d.*, including the high average price of 20*l.* in 1854, when a bad black blight prevailed.

The lowest average prices in the period ending 1854 were 3*l.* 10*s.* in 1847, and 2*l.* 15*s.* in 1848, as stated above. The lowest average prices in the period ending 1889 were 2*l.* 16*s.* in 1885, and 3*l.* 15*s.* in 1886.

It is believed that the highest price ever made for hops was for some exceptionally good samples in 1882, notwithstanding the large importations of hops from all parts of the world.

Although the crop of 1889 was large, and the quantity of hops sent to England from foreign countries was equal to the average, really good hops, especially Golding hops and good Worcesters, are, at the time this is written (June 1890), scarce and dear—that is, relatively to all foreign hops, and to common English qualities; and there hardly ever was such a clearance of good to useful English hops as at this time. This confirms what has long been believed, that well-grown and well-managed English hops of the best sorts are taken before all others by English brewers.

It was thought about twenty-five years ago that Kent Goldings were to be ousted by the choicest Bavarian hops; but these now rarely appear in the English market, as their supply is not more than equal to the home demand, for the German brewers are wise enough to secure these for their own consumption. Now the scare is that Pacific-Coast hops are to take the place of choice English produce; but though they are useful hops, and fairly well managed, they lack the delicacy and refined flavour of the better qualities of Kents, Farnhams, and Worcesters, and can never supersede these if care is taken with their production and management.

IMPORTS.

The importations of hops have naturally affected the values of those produced by English growers, and especially of the second- and third-class qualities. As shown before, the average annual price of hops since the repeal of the duty has not been less in an important degree than in previous periods. There has, however, been a larger decrease in the values of the low classes than in the highest classes of hops; and the tendency of the growers in these late years, as already noticed, has been to cultivate varieties of coarse and common quality, which crop abundantly.

From the Table annexed, showing the importations of hops since the duty has been taken off, it will be seen that there has been only a comparatively slight increase in the amounts, taking each decade. Thus, in the ten years ending 1869 there were 161,434 cwt. imported annually. In the decade ending 1879 the annual average quantity was 185,665 cwt. In that ending 1889 the imported hops amounted to 188,658 cwt., taking the average of the ten years.

Imports of Foreign Hops, with Values.

Year	Cwt.	Value	Year	Cwt.	Value
		£			£
1840	107	—	1865	82,479	459,157
1841	34	—	1866	86,687	567,760
1842	—	—	1867	296,117	1,626,941
1843	28	—	1868	231,720	689,383
1844	267	—	1869	322,515	1,098,475
1845	726	—	1870	127,853	428,525
1846	3,283	—	1871	218,664	895,895
1847	1,471	—	1872	135,965	679,276
1848	385	—	1873	122,729	602,914
1849	5,285	—	1874	145,994	929,641
1850	6,479	—	1875	256,444	1,188,054
1851	462	—	1876	167,866	763,440
1852	309	—	1877	250,039	1,170,821
1853	42,344	—	1878	168,834	631,567
1854	119,040	1,133,644	1879	262,765	1,217,988
1855	24,662	171,955	1880	195,987	900,891
1856	15,987	39,987	1881	147,599	695,297
1857	18,711	54,965	1882	319,620	2,962,631
1858	13,000	36,618	1883	129,900	1,089,246
1859	2,220	4,991	1884	256,777	1,615,309
1860	68,918	568,901	1885	266,952	1,001,723
1861	149,176	657,763	1886	153,769	447,253
1862	133,791	723,034	1887	145,122	427,753
1863	147,281	626,660	1888	216,606	799,391
1864	98,656	549,863	1889	199,384	713,094

The annual average amount of the importation of hops during the last twenty years is 187,161 cwt., of a total value

of 19,150,464*l.* The value of the hops imported in the first ten years of this period was 8,507,871*l.*, and for the second ten years, 6,652,593*l.*

As a good deal of misconception exists with regard to the relative quantities of hops that are imported from the hop-producing countries, the following Table has been prepared, which proves that America, the chief bugbear of the English grower, is not the principal exporting country, and that Germany, though having an enormous acreage, has sent comparatively few hops here.

The Principal Sources of Hops Imported into England in the past Fifteen Years.

Year	America		Germany		Belgium and Holland	
	Cwt.	Value	Cwt.	Value	Cwt.	Value
		£		£		£
1875	42,405	201,874	91,752	446,153	118,155	518,582
1876	67,752	311,816	40,761	189,922	56,084	229,937
1877	116,888	577,650	55,821	256,804	70,792	310,625
1878	96,603	351,711	21,866	83,233	45,078	152,853
1879	108,306	496,886	50,567	237,618	89,281	424,890
1880	41,579	209,665	56,751	249,372	87,677	388,833
1881	57,333	274,470	17,649	90,026	66,929	301,311
1882	76,346	579,064	55,685	521,928	162,696	1,518,900
1883	53,206	493,570	8,961	78,648	51,822	386,876
1884	106,564	727,454	38,459	231,375	81,671	472,767
1885	106,725	422,003	29,995	115,692	103,816	359,515
1886	33,928	108,213	17,427	55,261	90,798	244,052
1887	36,343	111,086	34,137	95,659	56,344	155,020
1888	89,295	346,313	38,614	138,896	63,988	211,869
1889	77,529	272,115	20,492	72,214	86,321	287,664

Belgium and Holland, according to this Table, stand first, with an annual average exportation of 82,076 cwt. during the past fifteen years.¹ America comes next, with 74,053 cwt. per annum; and then Germany, with 38,575 cwt. per annum. An average annual consignment of about 15,000 cwt. of hops has been sent from France to England during the same period, and a few hundredweights have come from Canada. Russia began first to export hops to England in 1882, and Australasia in 1885; but their consignments are at present insignificant. Hop-growing in Australasia seems not to be profitable, as the acreage decreases.

EXPORTS OF HOPS FROM GREAT BRITAIN.

The exports of hops from Great Britain have averaged 11,506 cwt. per annum in the last fifteen years. These are hops grown in this country.

¹ The hops imported from these countries are generally of a low class.

An account of the exports of hops in each year from 1875, with their value, is given below :

Exports of Hops from Great Britain.

Year	Cwt.	Value	Year	Cwt.	Value
		£			£
1875	13,140	86,691	1883	8,787	90,462
1876	20,305	144,736	1884	8,913	55,234
1877	13,508	88,635	1885	7,094	40,410
1878	12,520	57,220	1886	19,142	70,752
1879	7,153	43,771	1887	12,515	49,994
1880	9,018	52,647	1888	8,289	48,382
1881	13,727	81,078	1889	10,293	51,012
1882	8,186	81,534	—	—	—
—	—	—	Total .	172,590	1,042,558

Besides these, during the same period 171,962 cwt. of hops grown in foreign and colonial countries have been re-shipped from Great Britain, equal to an annual average quantity of 11,464 cwt. The total value of the hops grown in foreign and colonial countries and exported from Great Britain since 1874 is 782,511*l*.

Australasia and India have taken the greater part of the home-produced hops exported from Great Britain.

COST OF PRODUCTION.

The expenses of producing hops have been materially increased since 1840 ; but they are not so great as they were ten years back. Labour is not so expensive, manures are not so dear, and rents have been reduced, while poles are cheaper. Towards the end of the last century the cost of hop-production, as given by Arthur Young,¹ was 3*l*. 10*s*. per acre, made up as follows :—

	£	s.	d.
Rent	3	0	0
Tithe	0	10	0
Rates	0	10	0
Labour of all sorts	10	0	0
Manure	4	0	0
Duty, about	5	0	0
Poles	3	0	0
Drying, packing, &c.	2	0	0
Interest on outlay and cost	1	0	0
Interest of capital	2	10	0
	£31	10	0

¹ *Annals of Agriculture.* By Arthur Young, Esq., F.R.S. Vol. II., p. 166.

Another estimate is given by Arthur Young, of hop-land in Suffolk at about the same date, which puts the production of an average crop at 31*l.* 1*s.* per acre, including duty, which was at that time only 10*s.* per cwt.

In the "Annals of Agriculture" a somewhat remarkable account of three years' hop-growing is given, furnished by Lord Romney, of the Mote, Maidstone.

The average return of these three years—1798, 1799, and 1800—was 8 cwt. per acre, upon which the cost as given below is based:—¹

	£	s.	d.
Rent	3	0	0
Tithe	0	14	0
Rates	0	15	0
Poles	10	0	0
Manures	5	0	0
Labour	5	0	0
Picking	4	16	0
Duty ²	4	0	0
Drying and packing	1	15	6
Carriage	3	0	0
Interest	2	0	0
	£40	0	6

The average profit upon forty acres of hop-land in these three years was 57*l.* 5*s.* per acre, according to Lord Romney's figures.

Marshall states, in his "Rural Economy of the Southern Counties," that the annual average cost of cultivating an acre of hops at the end of the last century was about 26*l.* 15*s.*, exclusive of duty; and it would be about the same from that time to 1840.

At the present time the cost of hop-production, taking the country average throughout, is close upon 35*l.* per acre. In the appended detailed estimate sulphuring is included, as it has practically become a part of the general course of cultivation. Unfortunately, washing expenses have frequently to be added.

Upon many of the best-managed and most remunerative hop-farms this estimate is largely exceeded. 40*l.* per acre is frequently expended by growers who leave nothing undone to secure a crop: who cultivate thoroughly, also sulphur regularly, and often wash all the hop plants upon their farms two or three times over.

¹ *Annals of Agriculture*. Vol. XII., p. 485.

² The "old" duty, upon which the hop-crop is calculated to this day, was 10*s.* 8 $\frac{1}{2}$ *d.* per cwt. In 1802 it was increased to 1*l.* 3*s.* 4*d.* per cwt. It was reduced in 1805 to 19*s.* 7 $\frac{1}{2}$ *d.* per cwt., and remained so till it was taken off in 1862.

Average Annual Cost of an Acre of Hop-Land.

	£	s.	d.
Manure (winter and summer)	0	15	0
Digging and dressing	1	6	0
Poling, tying, earthing, and ladder-tying	1	15	0
Nidgeting, digging, and hoeing hills	3	2	6
Stacking, stripping, making bines, &c.	0	17	6
Annual supply of poles	3	0	0
Expense of picking, drying, packing, carriage, sampling, sale, &c., of an average crop of 7 cwt. per acre	10	10	0
Rent, rates, tithes, taxes, repair of oast, &c., interest on capital	6	5	0
Sulphuring	1	0	0
	34	11	0
Washing, say	1	10	0
	£36	1	0

THE SUPPLY AND CONSUMPTION OF HOPS.

Taking the last twenty years, it is considered by good authorities that the total quantity of English and foreign hops available in this country, after those exported have been deducted, has amounted to about 13,000,000 cwt.

It is computed that, allowing 10 lbs. of hops for every quarter of malt and sugar estimated as malt¹ used by brewers, during the first ten years of this period, and 9 lbs. per quarter for the latter period, about 12,500,000 cwt. of hops have been consumed in Great Britain in the last twenty years, showing an excess of 500,000 cwt.

If, however, the supply and consumption of hops for the last two years are considered independently, it will be found that the consumption has exceeded the supply; which tallies with the statement previously made, that the stocks of hops in this country were never much lower than at present: and this must be accepted as a good augury for coming seasons.

There has been a considerable surplus in some years, but this has probably consisted of brown, blighted, or mouldy samples, or of common hops which ought not to have been picked, and of low-class Belgians and Germans. In 1882, when hops were very scarce, dear, and of poor quality, substitutes, such as quassia,²

¹ It is calculated that 210 lbs. of sugar are supposed to be equivalent to a quarter of malt. From 1870 to 1880 the annual average quantity of sugar and other saccharine substitutes for malt was 770,000,000 lbs. From 1880 to 1889 it was over 1,488,211,499 lbs. A large increase is shown in the last five years.

² It has been said that quassia is largely used as a substitute for hops because its price occasionally increases so much and so suddenly; but this is due to the great demand for it as an insectifuge for washing hop plants, apple-trees, and other fruit-trees.

gentian, and chiretta, were employed to some extent, estimated variously to equal from 30,000 to 60,000 cwt. of hops. These are not used by large brewers, nor by any who care about the reputation of their beer; and it is believed that they do not appreciably affect the demand for hops, save in famine seasons, as that of 1882.

A great change has come over the beer-drinking public of Great Britain within the last ten years, and the manufacture of beer has undergone much modification. The demand for heavy beer of an intoxicating nature has ceased to a great extent. "Old ale" is almost traditionary. Beer of less specific gravity, of a far less stimulating character, is required now, somewhat resembling the lager beer of Germany. Fewer hops are used both for brewing this beer and for preserving it afterwards by the addition of hops put in a dry state into the bung-holes of the casks. It is calculated that since 1880 the decrease in the use of hops for brewing and "dry hopping" amounts to at least one pound of hops per barrel of beer.

Light beer and quick draught are the order of the present day. But this means a considerable and gradual increase in the consumption of beer, and a consequent increase in the aggregate quantity of hops used per annum.¹

THE WORLD'S HOP-ACREAGE AND HOP CONSUMPTION.

According to a German compilation, the total acreage of hop-land in the world was 293,549 acres in 1889, distributed as indicated by the figures given below. These are believed to be fairly accurate, as the acreages of some of the countries are shown in official returns.

The Hop-Acreage of the World in 1889.

Name of country	Acres
Germany	110,000
Austro-Hungary	35,000
Belgium and Holland	10,500
France	8,500
Denmark	500
Norway and Sweden	175
Russia	4,500
Switzerland	150
United States and North America	50,000
Australasia	15,000
Great Britain	57,724
Other countries	1,500
	293,549

¹ It is computed that more hops were used by brewers in 1889 than in any year since 1831. More malt, or malt and saccharines equivalent to malt, was taken by brewers in 1889 than in any year since 1878. In only two previous years has the amount used in 1889 been exceeded.

It is computed that an average crop, taking the whole of these countries round, is equal to 1,700,000 cwt., or between $5\frac{1}{4}$ and 6 cwt. per acre,¹ which is said to be slightly more than 6 per cent. above the requirements of the whole brewing-world. Of this surplus, much rubbish and inferior qualities of hops are produced upon land that is not suited for hop-growing. In all other countries, as in England, there is only a limited extent of land upon which hops can be profitably cultivated. When depression comes, caused by over-production, the unsuitable land is grubbed. After a year or two of good prices there is a rush to plant hops again, with the same inevitable disappointment and loss.

CONCLUSION.

It may be said, in conclusion, that those hop-planters who have farmed hop-land thoroughly well, and levelled up the management of their hops to meet the requirements of the times, have at least held their own throughout the period of depression.

In a cycle before this period much money was made by hop-planters generally, in spite of large importations of foreign hops.² From 1865 to 1877 there were never better times for hop-producers in this country. This caused a rapid and indiscriminate increase in the hop-acreage, and led to the planting of common kinds of hops on land not suited for hop-production. In many cases this was done by men who had not sufficient capital to enable them properly to work extended acreages.

Taking the average during the last fifty years of the proceeds of hop-growing in England, it may be said without any hesitation, that far more money has been made in this than in any other branch of agriculture. It is believed that this culture will still pay, and pay well, if planters will rest satisfied with their reduced holdings of hop-land, and will grow only the best kinds, and employ the most approved modes of cultivation and management. Hops are not like wheat, which in other countries can be produced of as good quality as in Great Britain. No country under the sun can yield hops possessing the rare attributes of the best English growths, whose indefinable aromatic essences, given off in the "rub-down," are appreciable in the samples by experts, and whose value and power in the "copper" are supreme.

CHARLES WHITEHEAD.

¹ The average return per acre of German hop-land is much smaller than in England, which is estimated at about 7 cwt. per acre. The largest return per acre is in the Pacific-Coast hop-land, of comparatively recent planting.

² In 1867, 1868, 1869, the importations of hops amounted to 296,117, 231,720, and 322,515 cwt. respectively, the quantity in 1869 being larger than in any previous or subsequent year.

THE BEST MEANS OF INCREASING THE HOME-PRODUCTION OF BEEF.

THE mild winter of 1888-9 and the plentiful supply of keep have had, practically, no effect in adding to the cattle-population of Great Britain, the increase being only 0·2 per cent. Whilst there is scarcely any difference in the numbers in England as compared with those of last year, Wales shows a decrease, and only in Scotland has any progress been made. Cows and heifers in milk and in calf have shrunk in numbers: this is a result sincerely to be deplored, and one that cannot easily be reconciled with the general immunity from contagious diseases, though, undoubtedly, there are other agencies at work which tend to retard the progress of rearing.

Throughout the great dairy-districts, with which I am practically acquainted, the development of the town milk-trade has been a potent means of lessening the numbers of our home-bred stock. The risk incurred and the personal superintendence necessary to attain satisfactory results were held by many to be too great to justify the effort, and hence they preferred to adopt the questionable alternative of purchasing at note (*i.e.*, in-calf) rather than of raising their own stock. The general expansion of the milk-trade has had a further deteriorating influence on the returns of the dairy-farmer. Much less attention has been paid to the selection and use of well-bred bulls, and hence there is a great falling off in the quality of the young stock. Twelve years ago there were in my parish 160 cows, on four farms, that could probably not have been excelled in any one parish in the county, whilst well-bred bulls were kept, and the stock was nearly all home-reared: although we have an equal number of stock to-day, they are vastly inferior in quality.

In many districts the want of sufficient and suitable buildings for the rearing of young stock is another formidable obstacle which must be grappled with. There is clearly room and to spare for the expansion of British agriculture, under skilful and intelligent direction, in the raising of home-products of a perishable character; of these, milk and meat are the most important. Two years ago many hundreds of calves were sold in Derby market at 2s. 6d. to 15s. per head; to-day (May. 6) they have made from 28s. to 60s. Now everyone is rearing, but not with the most satisfactory results, the mortality in many cases being very heavy.

If the lands of Great Britain are stocked and cultivated on rational principles, I see no fear of the land returning to a prairie.

value, as predicted by the pessimists. Prices will, no doubt, be equalised, and, in the case of wheat, except through social revolution or other unforeseen causes, quotations are likely to rule low. During the Crimean War prices were inflated, old pastures were broken up, and wheat was grown on lands never naturally adapted to the growth of the crop; the nitrogen contained in the first 9 or 10 inches of some old pastures was sufficient to produce two or three crops in succession without any outlay on manure. But a day of reckoning was at hand: prices declined, and the exhausted soils could no longer produce crops sufficient to pay the cost of cultivation independently of rent. Then followed the craze for laying down to permanent pasture; the labourers were driven from the land, industrious men were ruined, farms were thrown up on all sides, and the latter state was worse than the first. I am happy to think there is a more hopeful prospect. Men are quickly becoming aware of the fact that the success of agriculture does not depend on laying the whole of the land to grass. The more intelligent and industrious are changing their system to mixed husbandry; and, where the farms are well-equipped with buildings, there is little difficulty in finding tenants at fair rents.

I wish to lay stress on the importance of breeding and rearing; in fact, any farm, to be successful, must be self-supporting in the matter of stock, and to this end the cultivation of the tillage land must be subservient. Throughout a great part of England the farmer can produce all the feeding-stuffs he requires; the cereals and legumes, and even linseed, he can grow as cheaply as the cultivators of the highly-extolled virgin soils of the Far West. With our present reduced rents, and a clearer knowledge of the use and value of artificial foods and fertilisers, I do not despair of growing wheat on suitable soils at a profit, even at the price of 30s. per quarter; and in good seasons we are still able to produce fine samples of malting-barley. All second-rate corn must be used in the rearing and feeding of stock.

Soil and climate to a considerable extent fix the habitat of the different races of our domesticated animals. Whatever the breed, the first stage of improvement must begin with the male, and to this end it is essential that pure-bred sires be used. I have known many instances, in the dairy-districts, of well-bred Shorthorn bulls being used for a few years; then, on the mistaken notion of a narrow-minded economy, a bull-calf is saved from a favourite cow, and eventually used in the herd, which soon reverts to its original state. To a tenant-farmer of ordinary intelligence, I cannot conceive a more inter-

esting and profitable branch of his calling than that of building up a herd of milking-cows, let the breed be what it may. Throughout the dairy-districts of the Midlands we pin our faith to what is generally known as the home-bred, or Yorkshire Shorthorn, which for the general purpose of the locality cannot be excelled.

Commencing with well-selected cows or heifers of unrecorded pedigree, on which is used a pedigree bull, it is surprising what improvement can be made in a few generations. The ordinary dairy-farmer, as a rule, has a horror of pedigree; and yet, at the depleting farm sales, hair, colour, and quality invariably induce competition; this spring I have known unpedigreed yearling heifers make up to 16*l.* each. A dairy-farmer should keep a separate milk record of every cow in his herd; yet many neglect this important point on the plea of extra trouble. It is not trouble, but method, which results in profit, not only because it enables the owner to draft out inferior milkers, which leave only a small margin of profit beyond the cost of food, but because a good milk record enhances the market-value of the animal.

In the altered conditions under which we are placed, the chief aim of the British farmer must be the production of milk and of meat. The extension of breeding is a work of time. We must first increase the number of our breeding-animals, and in order to do this a great number of calves must be raised. The difficulties of rearing are less than those of securing the most desirable class of young animals, and, before a sufficient supply of breeding-animals can be obtained to meet the pressing wants of an improved system, several years must necessarily elapse. Under the assumption that, with the exception of the best grazing-lands, every farm becomes a breeding and feeding farm to the extent of its capabilities, then, when fairly stocked, a fixed proportion of its produce will pass to the butcher every year. The stock of an ordinary mixed occupation of 300 acres should have forty breeding-cows in milk or in calf, forty calves, forty yearlings, and forty two-year-olds fit for the butcher. It is idle to suppose that the whole of the calves, the produce of any one year, can, under the most skilful management, be brought to the block, though I purpose subsequently to show that the present rate of mortality may be considerably lowered. Any deficiency in numbers should be made up by purchases, in order to maintain a uniform output.

By strictly carrying out this system, the stock-bearing capabilities of the farm are susceptible of considerable development. A practical illustration of this was afforded, during the autumn of 1888, in the award of Lord Burton's prizes, through the Staffordshire Agricultural Society, within a radius of twenty miles of

Burton-on-Trent. By reducing the sheep to a cattle standard—that is, allowing a certain number of sheep as being equal to one head of cattle—we found on some of the competing farms one head of cattle for each acre and a-half of the entire occupation. I need hardly say that, in addition to a large consumption of home-grown corn, the bill for purchased food was a heavy one; nevertheless, the farms were being worked at a profit.

No department of the farmer's business requires a greater amount of practical skill and constant supervision than the rearing of young stock; the old adage, that the "master's eye grazes the ox," is a well-worn truism, never more true than when applied to the rearing of the young animal. There are many different systems of rearing, some of which are now obsolete. The milkmaid and the calf, one on each side of the cow, are no longer competitors for a share of the lacteal fluid; nor is the calf allowed to suck at will, except in a few isolated cases, where the dam and offspring are confined in a yard or box, and finished for the butcher when the calf is from twelve to eighteen months old. The system of allowing the calves to run with and suck their dams until they were twelve months old resulted in making good yearlings, but at a cost that could not be tolerated in these days; under this system the cows were erratic breeders, frequently producing only one calf in two years. During the great Shorthorn mania, it was a not uncommon practice to let the calf remain with the dam for many months. Successful stock-raisers now adopt a more rational principle: the calf is at once removed from the dam, and fed from the pail. The beastings, or first milk, possesses certain medicinal properties conducive to the health of the young animal; hence this milk is used for the first few days. Some use new milk for the first three or four weeks, although this is not necessary.

As regards stock-rearing, the mechanical separator is the great invention of the age. The new milk is passed through the separator immediately it is drawn from the cow. With the exception of the butter-fat, nearly the whole of the original solids remain in the milk. Fats of an equally efficient and less costly character can be substituted, and may consist of linseed-meal and several crude oils of a cheap character. As the young animal increases in strength, a mixture of wheat, oat, and pea meal may be used with the milk. The success of rearing depends to a great extent on the care bestowed on the young animals: their food must be supplied at regular intervals, and, what is of the utmost importance, the milk must be fed at an uniform temperature—80 degrees is the best. During separation the temperature will fall considerably; it must then

be raised to the normal point—not in a vessel placed over the fire, which destroys the flavour, and to some extent alters the nutritive quality of the milk, but either by putting the separated milk into tins, and immersing them in boiling water, or, what is preferable, using a jet of steam. All the pails and vessels used for handling the separated milk should be kept scrupulously clean and sweet. The varying temperatures at which the milk is often fed, and the development of acidity caused by the use of dirty vessels, are the primary causes of scour and other irregularities of the digestive organs, inducing a mortality which frequently reaches 25 per cent.

Neither stock-raising nor dairying can be separately carried on to the most profitable advantage—there must be a combination of the two industries; and this, again, involves a complete change in the general system of management, so far as regards the produce of the dairy. As soon as drawn from the cow, the milk must be passed through a separator, the chief difficulty on many farms being a suitable motive power. For small dairies, hand or horse power meets the requirements; the 40-cow dairies and upwards need something more powerful. In hilly districts, where water is available, a small turbine is not only the cheapest but the most satisfactory. On large occupations, where steam is generally used, the chief difficulty is that of cost. Having provided for this, there is yet another step—the factory; this should be centrally situated and generally accessible. The cream is delivered daily from the farm, to the factory, where it is made into butter; or, during the summer months, a part may be sold as raw cream. On a moderate computation, an average cow will produce 220 lb. of butter during the twelve months, which, at 1s. per lb., is 11l.; by an additional outlay of 5l. per cow on home-grown corn and oily seeds, in part to supply the butter-fat abstracted from the milk, a calf can be reared, which in ordinary times will be worth 10l. when a year old (with present high prices many have been sold for 50 per cent. more). A single calf would not consume the whole of the separated milk, and there would be a surplus sufficient to produce 200 lb. of pork, at 6d. per lb. Having deducted the cost of the home-grown foods consumed by the calf and pigs, the gross return per cow is 20l.; from this must be deducted the value of the meal and other home-grown foods fed to the cows.

On every mixed occupation I entirely repudiate the purchase of foreign feeding stuffs; the farm can and must supply all that is required for the production both of milk and of meat. The cropping of the tillage land must be regulated to meet the requirements of the stock. If the land is clean, and kept up to

the mark in manurial condition, I care little about the rotation. A succession of forage crops must be grown: the root crops should follow Italian rye-grass, rye, or vetches, carted off, and consumed in the yards, or part folded on the land by sheep. By this means the sowing of the general root crop is retarded; but this is seldom much loss, for what we lose in quantity we gain in quality. Nitrogenous and phosphatic manures should be pretty freely used for the forage crops. The farmyard manure is most effective when applied judiciously in light dressings for the roots, and as a top-dressing to the mowing-grounds and seed-layers. Nitrification proceeds slowly at depths below 12 inches. Light dressings of nitrate of soda and phosphatic manures have a marked effect in developing the growth of all spring crops, thereby increasing the available supply of food at a critical period.

The cost of labour is in most districts the chief cause operating against the development of the soiling system, which in the case of dairying and rearing is the most profitable. I have recently inspected some farms in the neighbourhood of Edinburgh where a profitable system is carried out. A superior class of cows is bought within a few days of calving; they are worked on a high-pressure system, both as to feeding and milking, and never leave the sheds until they go to the slaughter-house. The quantity of milk they produce appears to an ordinary farmer fabulous. The town milk-trade in Scotland is carried out on different lines to that of England, and, although in individual cases the system is a profitable one, it is not generally adapted to the rural districts. The public require meat as well as milk, and it is to the legitimate and increased production of both that the efforts of the British farmer should be directed. On purely tillage farms a much larger head of cattle can be kept throughout the year than has generally been the case. The increasing cost of labour militates against the widespread extension of the system. Nevertheless, tillage land, when allowed to remain down for two or three years, makes an excellent cow-pasture; good seed-layers produce more milk than the average quality of dairy-pastures. The early catch-crops carry the cows on to the middle of May; rye, Italian rye-grass, and tares are cut, and carted to the yards, and chaffed with a mixture of hay and straw; the meal of the home-grown corn is added, the whole is thoroughly mixed, and sprinkled with water to prevent waste, and should be prepared eight or ten hours before being used.

The chief difficulty at present to be met is the want of sufficient buildings. On many tillage farms the accommodation for stock is very limited; and this I would, on two grounds, propose to supply by cheap erections. The first reason is the scarcity of

available capital amongst the generality of landowners; and the second, the unstable and ever-changing conditions of agriculture, which cause a prudent man to reflect before he expends large sums on costly erections that in a few years may become a burden to the estate to maintain. At Elvaston we are largely using corrugated iron for roofing, and find it both cheap and serviceable. Dairy-cows require warmth; and for rearing and fattening cattle we prefer well-arranged covered sheds and yards on the North-country hammel system. We have only a wall on one side, and two gable ends, whilst a feeding-passage extends the whole length of the building; this secures a great economy of labour, and saves the cattle from disturbance. The sheds and yards are divided and enclosed by ordinary iron gas-pipe varying in diameter from $\frac{3}{4}$ in. to $1\frac{1}{2}$ in.; these pipes are passed through iron standards securely bolted to stone blocks placed 9 feet apart. The eaves of all buildings are spouted, and the rain-water is conducted to a well. The manure is not removed more than twice a year; the litter absorbs the urine, and, if the rain-water is excluded, under drains are not necessary. Contrary to the opinion of those unaccustomed to covered yards, the manure comes out in a ripe state; the constant treading of the cattle solidifies the manure, and prevents excessive fermentation. The winter-made manure comes out when the turnip season arrives, and is in a fit state to apply to the land at a temperature of 70° to 80° . We look upon this as a considerable advantage, as, when taken direct from the yards, and placed in the ridges, it raises the temperature of the soil and hastens the sprouting of the seeds.

In carrying out the system of rearing and feeding to the fullest extent, the straw of the cereals, when well harvested, is of great value in the rearing and fattening of the stock; when prudently used it economises hay, one of the most costly products of modern farming.

Our experience of the use of moss litter, both for cattle and horses, is of the most favourable character; one of its valuable properties is the readiness with which it absorbs and retains the liquid constituents of the manure, there being no drainage, and the manure being ready at any time, either for grass or tillage lands. The action of this manure, both on grass and tillage land, is quick, but not of long duration, as there is little appreciable result after the second year. For the rearing and feeding of young stock in yards moss litter is more conducive to health from a sanitary point of view: the sheds are always dry, and there is no offensive or unpleasant smell. A light sprinkling of fresh litter may be necessary every second day,

and in the case of rearing calves we have the droppings collected and removed daily.

The occupation in my mind is a typical farm of 252 acres in a Midland county, rented at 38s. to 40s. per acre, with a labour-bill of 30s. per acre. The following is a fair description of the farm, resting on a deep loam on the upper alluvium:—30 acres grazing land, 100 acres dairy or store pasture, 20 acres meadow, 102 acres tillage. The chief object is the production of milk and of meat. The tillage land is worked on a six-course rotation of 17 acres each, thus:—

(1st) 17 acres oats after second seeds; (2nd) 17 acres wheat after oats; (3rd) 17 acres turnip-fallow, catch-crops, and roots; (4th) 13 acres barley and 4 acres linseed; (5th and 6th) 17 acres seeds.

The 3rd shift is thus arranged:—2 acres winter oats and beans, sown immediately the wheat crop has been cut, followed in ten days by 2 acres rye, and these in another week by 3 acres of tares, the remaining 10 acres being reserved for early root crops. Of these, 2 acres are planted in November with early cabbages or Scotch kale, 4 acres are sown with mangel at the end of March or first week in April, and at the same time 2 acres of kohl-rabi are sown, the remaining 2 acres being sown with swedes early in May. By the end of May the winter oats and rye have been cleared, and the land sown with swedes. The tares will be ready by June 1, and the land is cleared for a crop of common turnips early in July. There should be a sufficient quantity of old manure left in the yards to supply a dressing of ten to twelve loads per acre, spread on the stubble, and ploughed in for the catch-crops, whilst later on this may be profitably supplemented by 1 cwt. nitrate of soda and 3 cwt. superphosphate, 32 per cent. soluble.

In the 4th shift the linseed should be used on the farm, and the straw disposed of to the paper-manufacturer. This shift is seeded down with mixed seeds for a two years' lay. As soon as the barley crop is harvested, the young seed-layers receive a dressing of twelve loads of farmyard manure. The land is not stocked during the winter, and is ready to cut for hay by June 10, and is then grazed by sheep and young cattle until the autumn, and afterwards affords the in-lamb ewes a healthy run during the winter months. The ewes receive half-a-pound of oats per day, along with a small allowance of cut chaff. The second year's seed-layers are grazed during both the summer and winter. The advantage of oats following the second year's seed-layers is twofold: first, the uncertainty of obtaining a good wheat plant on a two-year-old seed-layer is obviated;

and, secondly, the value of the pasture to a stock farmer from September to February is very considerable.

Having arranged the cropping, the next and most important consideration is the number, age, and variety of stock the farm will keep, and which will in all probability produce the best financial results. On the customary Lady-day entry we would commence with thirty good dairy cows, and if within reach of a butter-dairy we would sell the new milk to the dairy, and bring back the separated milk for use on the farm. If there were no dairy within reach, or no adjacent occupiers who would join us, we would set up a separator, sell what new cream we could, and make the remainder into butter; and we would rear not less than one calf to each cow. For the first two years it would be necessary to purchase young stock to tide over until such time as the farm could be made self-supporting. Once the system was fairly organised, there would be thirty head of cattle to go out each year; five or six cows would be drafted from the dairy yearly, and their places filled by an equal number of home-bred heifers. The draft cows would either pass direct to the butcher; or, probably, under present circumstances, they would pay better to sell as down-calvers to the town dairymen.

There is another old practice I should much like to see revived—that is, spaying all the heifers not required for breeding purposes. I believe the operation is neither difficult to perform nor attended with much danger, whilst it is obvious that the quality of the beef must be better. It is unnecessary to point out to those who are practically acquainted with the management of cattle the check to the progress of the animal through the periodic recurrence of natural causes. With the exception of those retained for breeding purposes, all the young stock would go to the butcher at a little over two years of age; the best time to bring them out is between the first of April and the end of June. If the bulls have been selected with judgment, each generation would improve for a long series of years. What an interesting and profitable opportunity for an intelligent young man to build up a herd of superior milkers!

The old-fashioned practice of dairy-farmers as to the period of calving cannot be recommended. There were no winter dairies in the old days; calving rarely commenced before the middle of March or beginning of April; yet it cannot be disputed that the best time for rearing calves is from October to February. The price of dairy-produce rules higher in the winter than in the summer months; and there is the further advantage that the gross

yield of milk is greater from winter- than from spring- and summer-calved cows. It is surprising how the flow of milk increases when the cows are placed on succulent food, or when turned out on the pastures, though no doubt this system is a heavy drain on the cow, whose condition must be sustained by the use of a liberal allowance of well-selected food. It is a mistaken notion to confine rearing-calves in dark, ill-ventilated buildings. A moderately high temperature, of 55° to 60° , economises food to some extent; nevertheless, young calves require plenty of pure air and a fair amount of exercise. The yard should be sheltered from currents of cold air; every rearing-shed should have a roomy yard attached, in which the young animals can enjoy the sun and air; and every well-constructed calf-shed should have a feeding-passage along one side, whence the stock can be fed and inspected without disturbance or excitement.

Rearing-calves three or four months old are generally turned out into the pastures towards the end of July, and left to take care of themselves. This practice is open to grave censure, for they gradually lose their calf's flesh, and, as the nights lengthen and the temperature falls, they almost invariably contract hoose, which is difficult to combat and generally decimates the year's produce. Strong calves may have a run in the pastures during the day, but should return to the yards at night, and still receive a liberal allowance of artificial food and separated milk, if it can be obtained.

The yearlings are wintered in composite yards—that is, partly covered and partly open. The basis of their food consists of a mixture of hay and straw chaff, to which are added carefully blended meals of the different cereals, with a little ground linseed and a few pulped roots. I find no variety of root equal to kohlrabi for the purpose of rearing young stock. I advocate the steaming of the mixture, not because it increases the nutritive value of the food, but because it lessens the strain on the digestive organs, and hence economises food; in these times of dear labour the increased expense entailed in steaming is a bar to its extension. Next to steaming, the best plan is to saturate the mixed food with water, and allow it to remain in the heap some twelve hours before being fed.

Without wearying the reader with further details, the plan I have sketched would, with improved management, serve in a few years to keep a much larger head of stock than that I have named. The sale tugs would go to the butcher at from ten to twelve months old, and would easily weigh eighteen to twenty pounds per quarter; store sheep would be bought in accordance with the state of the keep. It is constantly being

dinned into our ears that, as everyone is rearing stock, prices will recede to a very low point; yet the experience of everyday life confirms the opinion that my contention is sound. Protect us from imported disease, and we can hold our own with any country on the globe. We are urged to import American stores, and thus increase our profits; but what do the East of Scotland farmers say, who have had experience of American cattle for the last two years? They tell us they are bought big for money, are slow feeders; and, when placed beside the Aberdeens and cross-breeds in the Metropolitan Christmas market, they do not realise so much by a penny per pound. Since the middle of May the importations of beef and cattle on the hoof have exceeded all precedent; sides and whole carcasses have been selling in Derby Market at $5\frac{1}{2}d.$ per pound, which must be a ruinous speculation. It has been asserted that every fat animal imported from the States since the beginning of January has entailed a loss of nine pounds (9*l.*) per head. There must shortly be an end to this, for no man or body of men will long pursue a losing game.

Now is a favourable opportunity to make a bold effort to regain a portion of the trade we have lost. We cannot provide for the entire wants of our population, which increases at the rate of a thousand per day, and must have food and raiment. So long as our home industries continue in a prosperous state, the working-classes will continue to be our best customers, as they have already discovered that the sapless mutton of New Zealand is not an economical food, though purchased at a low price.

GILBERT MURRAY.

THE HERBAGE OF PASTURES.

PASTURES are chiefly known by their effects, and many grazing lands possess a high and well-deserved reputation for their meat and milk producing capabilities. It was to obtain some insight into the botanical composition, both qualitative and quantitative, of the herbage of such pastures that the investigation which is the subject of the present record was undertaken.

From each of the pastures selected for observation, a turf was dug, its dimensions being two feet long, one foot broad, and nine inches deep. This was put into a wooden box just large enough to hold it, and sent to me, so that, on opening the box,

I found a brick-shaped block of soil, clothed at the top with green sward. Each block of turf, as it came to hand, was planted in bare land of very poor quality, to such a depth that the herbage came on a level with the surrounding soil. Save that the adjacent land was kept free from weeds, the turfs received no treatment whatever; they were simply allowed to grow upon their own soils, and were carefully watched from day to day, in order that the botany of each turf might be accurately recorded. After June the herbage upon each area in turn was closely cut with sheep-shears, and at once submitted to botanical analysis, firstly into its proximate constituents of gramineous herbage, leguminous herbage, and miscellaneous herbage, and then each of these sections into its specific ingredients. As soon as possible these were weighed in the green state on a balance, with metric weights, and the results recorded.

A former volume of this Journal¹ contains the results of a previous investigation of a similar nature, and it was in consequence of the controversy which arose thereon that I determined to continue the inquiry upon fresh pastures, and in a different season, in order the more thoroughly to test the validity of the conclusions based upon the results of the former series of experiments.

The total number of blocks of turf which have thus been subjected to investigation is 80, this including the 25 comprised in the first inquiry. Of these, 48 came from England, 6 from Wales, 14 from Ireland, and 12 from Scotland. Of the English specimens, 5 were obtained from Somerset; 3 each from Berkshire, Cambridgeshire, and Shropshire; 2 each from Cheshire, Cumberland, Derbyshire, Dorset, Essex, Kent, Lincolnshire, Monmouthshire, Staffordshire, and Wiltshire; and 1 each from Buckinghamshire, Devon, Durham, Gloucestershire, Hampshire, Herefordshire, Lancashire, Leicestershire, Northumberland, Warwickshire, Westmoreland, Worcestershire, Yorkshire (East Riding), and Yorkshire (North Riding). In all, therefore, 28 English counties are represented, this being two-thirds of the total number. Exactly half of the counties of Wales are represented, one turf having been received from Cardiganshire, Carmarthenshire, Carnarvonshire, Denbighshire, Merionethshire, and Pembrokeshire, respectively. The 14 Irish turfs come from 11 counties: 3 from Meath, 2 from Kildare, and 1 each from Antrim, Clare, Cork, Dublin, Kerry, Mayo, Queen's Co., Tipperary, and Wexford. Scotland furnished 3 specimens from Perthshire; 2 each from Forfarshire and Midlothian; and 1

¹ Vol. XXIV., 2nd Series (1888).



each from Aberdeenshire, Banffshire, Dumfriesshire, Morayshire, and Roxburghshire—8 counties in all.

My notebook records (1) the general appearance of each plot from time to time; (2) the name of every species of plant observed growing upon each plot; (3) the total weight in grams of the cut herbage from each turf; (4) the actual weight, when it exceeds one gram, of each species of plant separated from the herbage of each plot; (5) the calculated percentage by weight of each species when present in a significant proportion. In consequence of the large amount of material I had to deal with, it was impossible to work down each mass of herbage so that the undetermined residue should be less than one gram; hence in all cases there is a variable, but usually small, proportion of grassy herbage registered as "undetermined." All that has been attempted in the following pages is to give (a) a short account of the origin and history of each specimen; (b) the respective percentages by weight of its gramineous, leguminous, and miscellaneous herbage; (c) a few notes on the leguminous and miscellaneous herbage; (d) the proportionate weight per cent. in which the various species of grasses are contained in the gramineous herbage.

It will be observed that, in describing the several specimens, I have in nearly every case stated whether or not roots or rootlets were visible on the lower or deep face of the turf. This was all the more necessary on account of the circumstance that the Consulting Botanist of the Royal Agricultural Society had argued "that in cutting away to a depth of nine inches of turf the deep-rooted plants which belong to the pasture were injured." So far as my observations extended, there was no indication of any such injury as that suggested. But I also tested the validity of this objection in quite another way.

Whilst admitting the established fact that certain plants send their roots to a considerable depth, it appeared to me that some confusion had been made between root-range, on the one hand, and the effects of root-section, on the other. To settle the point at issue, I selected the following plants:—

Alopecurus pratensis, L.—Meadow
foxtail grass.
Avena elatior, L.—False oat-grass.
Dactylis glomerata, L.—Rough
cockfoot grass.
Elymus condensatus.—Canadian
bunch grass.
Festuca pratensis, Huds.—Meadow
fescue grass.
Phleum pratense, L.—Timothy grass.

Trifolium pratense, L.—Purple or
meadow clover.
Medicago sativa, L.—Lucerne.
Taraxacum officinale, Web.—Dandelion.
Achillea Millefolium, L.—Milfoil or
yarrow.
Plantago lanceolata, L.—Ribwort or
plantain.

These plants were dug up in the early spring of 1889, their roots were well washed, and then the roots and root-fibres were cut through with scissors at various depths below the surface. Several specimens of each plant were taken, and the length of root after cutting never exceeded three inches, and sometimes was as little as one inch. The various specimens were then planted out in poor soil, and they not only lived, but in the course of the summer they all came into bloom. This test was far more severe than in the case of the nine-inch depths of turf, where there was no transplanting in the true sense of the word. *Elymus condensatus* and *Medicago sativa* are not British pasture plants; but the former was employed because it is a grass far more robust and of much stouter roots than any British grass; its roots were severed at a depth of between $1\frac{1}{2}$ and 2 inches. The latter is a notoriously deep-rooted plant, and the section of its roots was made at a depth of three inches. The experiment shows that root-section, even of very deep-rooted plants, may be performed, without fatal results, at exceedingly moderate depths. Moreover, it is a familiar circumstance that woody plants, such as rose-trees, may be successfully transplanted at a depth less than nine inches.

An interesting side-light on this point is afforded by the turfs themselves. Several of them were inadvertently cut less than three inches deep. Yet in two of these, Nos. 47 and 48 (page 373), the most abundant grass was found to be the stout deep-rooted species, *Dactylis glomerata*.

As the common or trivial names of native plants vary in different localities, the botanical or systematic names will be used throughout. For the reader's convenience, however, there are enumerated in the following lists all the plants which it will be necessary to mention. To facilitate reference, the species, in each of the three series, are arranged alphabetically. In consequence of the difficulty of separating the herbage of the species of *Agrostis*, I have, in the numerical tables, given them under the head of "*Agrostis* sp." if more than one species has been detected. The expression, "*Festuca ovina* et var.," embraces sheep's fescue (*Festuca ovina*, L.) and its varieties, hard fescue (*Festuca duriuscula*, L.), and creeping, or red fescue (*Festuca rubra*, L.).

Gramineous Species, or Grasses—Gramineæ.

<i>Agrostis alba</i> , L.	Marsh bent grass
<i>Agrostis alba</i> var. <i>stolonifera</i> , L.	Florin
<i>Agrostis vulgaris</i> , With.	Fine bent grass
<i>Alopecurus pratensis</i> , L.	Meadow foxtail
<i>Anthoxanthum odoratum</i> , L.	Sweet-scented vernal grass
<i>Avena elatior</i> , L.	False oat grass

<i>Avena flavescens</i> , L.	Yellow oat grass
<i>Bromus mollis</i> , L.	Soft brome grass
<i>Cynosurus cristatus</i> , L.	Dogstail
<i>Dactylis glomerata</i> , L.	Rough cocksfoot
<i>Festuca loliacea</i> , Huds.	Spiked fescue
<i>Festuca ovina</i> , L., et var.	Sheep's fescue
<i>Festuca pratensis</i> , auct.	Meadow fescue
<i>Holcus lanatus</i> , L.	Yorkshire fog, woolly soft grass
<i>Hordeum pratense</i> , Huds.	Meadow barley grass
<i>Lolium perenne</i> , L.	Rye grass
<i>Pbleum pratense</i> , L.	Timothy, or meadow catstail
<i>Poa annua</i> , L.	Annual meadow grass
<i>Poa pratensis</i> , L.	Smooth-stalked meadow grass
<i>Poa trivialis</i> , L.	Rough-stalked meadow grass
<i>Triticum caninum</i> , Huds.	Bearded wheat-grass

Leguminous Species—Leguminosæ.

<i>Lathyrus pratensis</i> , L.	Meadow vetchling
<i>Lotus corniculatus</i> , L.	Common birdsfoot trefoil
<i>Trifolium minus</i> , Sm.	Yellow suckling clover
<i>Trifolium pratense</i> , L.	Purple or meadow clover
<i>Trifolium repens</i> , L.	White or Dutch clover

Miscellaneous Species.

Botanical Name	Common Name	Natural Order
<i>Achillea Millefolium</i> , L.	Yarrow or milfoil	Umbelliferæ
<i>Bellis perennis</i> , L.	Daisy	Compositæ
<i>Bunium flexuosum</i> , With.	Earth-nut or pig-nut	Umbelliferæ
<i>Cardamine pratensis</i> , L.	Cuckoo flower	Cruciferae
<i>Carduus</i> sp.	Thistle	Compositæ
<i>Carex</i> sp.	Sedge	Cyperaceæ
<i>Cerastium triviale</i> , Link.	Narrow-leaved mouse-ear chickweed	Caryophyllaceæ
<i>Leontodon autumnalis</i> , L.	Autumnal hawkbit	Compositæ
<i>Leontodon hispidus</i> , L.	Rough hawkbit	Compositæ
<i>Luzula campestris</i> , Willd.	Field woodrush	Juncaceæ
<i>Plantago lanceolata</i> , L.	Ribgrass, ribwort, or plantain	Plantaginæ
<i>Potentilla Anserina</i> , L.	Silver-weed or goose-tongue	Rosaceæ
<i>Prunella vulgaris</i> , L.	Self heal	Labiatae
<i>Ranunculus acris</i> , L.	Upright buttercup	Ranunculaceæ
<i>Ranunculus bulbosus</i> , L.	Bulbous crowfoot or buttercup	Ranunculaceæ
<i>Ranunculus repens</i> , L.	Creeping crowfoot or buttercup	Ranunculaceæ
<i>Rhinanthus Crista-Galli</i> , L.	Yellow rattle	Scrophularinæ
<i>Rumex Acetosa</i> , L.	Common sorrel or sour dock	Polygonaceæ
<i>Rumex</i> sp.	Dock	Polygonaceæ
<i>Sonchus</i> sp.	Sowthistle	Compositæ
<i>Taraxacum officinale</i> , Web.	Dandelion	Compositæ
<i>Veronica Chamædrys</i> , L.	Germander speedwell	Scrophularinæ

In the former investigation, specimens from twenty-five pastures were examined, and these were consecutively numbered from 1 to 25. To avoid confusion, the turfs, the results from which are about to be described, were numbered from 26 onwards.

ENGLISH PASTURES.

No. 26.—A turf sent by Messrs. Wood & Bowman, 32, English Street Carlisle, Cumberland. It was taken from "King Meadow," a piece of permanent pasture on the estate of Mr. Miles MacInnes, M.P., Rickerby, situate along the north side of the river Eden, immediately above the Bridge at Carlisle adjoining Rickerby Park. Messrs. Wood and Bowman write:—

"The great feeding qualities of the pasture are acknowledged on all hands, and we may state that it is at all times of the year eaten very close and never permitted to seed. This is an interesting fact, as we expect a large portion of the herbage will be found to be rye-grass, and probably white clover. We had occasion to cut a drain through it recently, and although eight feet deep, we were not through the soil, which is a rich alluvial deposit."

In a subsequent communication they say:—

"In our first letter to you on the subject we stated our belief that the main portion of the herbage would be found to be rye-grass and white clover. Upon closer examination we find there is also a plant, apparently of the carrot species, which appears to be growing all over the field. Being near the town the present tenant takes in large numbers of sheep and cattle to graze, so that it is at all times eaten very bare. This we take to be of importance, because, if on examination a fair percentage of rye-grass be found, it ought to go a long way towards demonstrating the perennial nature of rye-grass, which seems to be a good deal disputed. At any rate, if rye-grass be found, we feel pretty sure that in this instance it cannot have been perpetuated by seeding."

They add that the pasture must be a very old one, as they cannot hear of its ever having been ploughed. The turf was nine inches deep, and the soil presented the appearance of a very uniform brownish sandy loam, a few root-fibres being noticeable on the lower face. As the herbage grew it was noted as being of a rich grassy character. Cut on July 6 it yielded:—

Gramineous herbage, 90 | Leguminous, a trace | Miscellaneous, 1.

The leguminous herbage consisted exclusively of *Trifolium repens*. The miscellaneous herbage was made up of *Conopodium denudatum*, *Rumex Acetosa*, and *Ranunculus bulbosus*, the first named being the plant of the carrot family (*Umbelliferæ*) referred to in the correspondence. The separation of the gramineous herbage gave the subjoined percentage results:—

<i>Lolium perenne</i>	69	<i>Poa trivialis</i>	3
<i>Agrostis stolonifera</i>	10	<i>Anthoxanthum odoratum</i> . .	1
<i>Holcus lanatus</i>	6	Undetermined	7
<i>Phleum pratense</i>	4		

No. 27.—A turf sent by Mr. Tom Birkett, Penrith, from a prime old pasture at "The Lawn," Kirkoswald, Cumberland. Mr. Birkett writes:—

"The Lawn" is situated on the bank of the river Eden, and has, since 1856, been let to graze, as one of the College Estate Grass Parks. I can get no evidence of its ever having been ploughed, and have no hesitation in stating that it has been pasture for the last hundred years. It has the reputation of being an excellent feeding pasture, and the turf sent will therefore, I think, answer your purpose."

The turf was dug nine inches deep, and the soil was a chocolate-coloured loam, very uniform and friable. There was no trace of rootlets on the deep face. Cut on July 1, the turf yielded:—

Gramineous herbage, 70 | Leguminous, 1 | Miscellaneous, 29.

The leguminous herbage was *Trifolium repens*, and the rather high proportion of the miscellaneous herbage was largely due to a big, succulent plant of *Leontodon hispidus*, the remainder being *Rumex Acetosa*, *Plantago lanceolata*, *Ranunculus acris*, *Conopodium denudatum*, *Cerastium triviale*, with traces of *Prunella vulgaris*, *Cardamine pratensis*, and *Luzula campestris*. The grasses were thus made up:—

<i>Lolium perenne</i>	80	<i>Anthoxanthum odoratum</i>	
<i>Holcus lanatus</i>	9	<i>Avena flavescens</i>	2
<i>Cynosurus cristatus</i>	2	<i>Agrostis</i> sp.	
<i>Poa trivialis</i>	2	<i>Dactylis glomerata</i>	a trace
		Undetermined	5

No. 28.—A turf sent by Mr. H. J. Swaffield, of Pilsbury, Hartington, Ashbourne, Derbyshire. It was dug from a pasture in the Valley of the Dove, resting on limestone at the foot of a steep high hill. It has not been ploughed for a century, if ever. During the last forty years it has been continuously pastured; previously it was occasionally mown. It affords good grazing for cows and sheep, but does not always suit the latter, on account of the many small springs at the foot of the hill, from which water flows over the pasture in very wet seasons. The turf was nine inches deep, and the soil had the appearance of a brown friable loam, somewhat stony; no rootlets were visible on the deep face. The herbage, cut on July 22, yielded:—

Gramineous herbage, 93 | Leguminous, a trace | Miscellaneous, 7.

The herbage was thus of a highly grassy character, and only a very small quantity of *Trifolium repens* was discoverable. *Rumex Acetosa* and *Ranunculus* sp. made up the miscellaneous ingredients. The grasses consisted of:—

<i>Lolium perenne</i>	45	<i>Phleum pratense</i>	4
<i>Agrostis</i> sp.	16	<i>Poa trivialis</i>	2
<i>Alopecurus pratensis</i>	13	<i>Holcus lanatus</i>	2
<i>Dactylis glomerata</i>	9	<i>Avena flavescens</i>	1
<i>Festuca ovina</i> et var.	5	Undetermined	3

The *Agrostis* was mostly *A. stolonifera*, with a little *A. vulgaris*.

No. 29.—A turf sent by Mr. H. Scorer, Burwell, Louth, Lincolnshire, from a good pasture always grazed by cattle. The turf, nine inches deep, showed no traces of rootlets on the lower face, and the soil was a reddish-brown loam. Cut on July 15, the turf yielded:—

Gramineous herbage, 98 | Leguminous, 1 | Miscellaneous, 1.

Save for the presence of *Trifolium repens* and *Ranunculus repens*, the herbage was entirely of grass, which was thus made up:—

<i>Lolium perenne</i>	72	<i>Avena flavescens</i>	2
<i>Agrostis</i> sp.	14	<i>Poa trivialis</i>	2
<i>Holcus lanatus</i>	3	<i>Dactylis glomerata</i>	1
<i>Cynosurus cristatus</i>	3	Undetermined	3

Both *Agrostis vulgaris* and *A. stolonifera* were present.

No. 30.—A turf sent by Mr. Harry Horrell, Wrydecroft, Thorney Fen, Cambridgeshire, from a well-known horse-rearing farm. It was dug from a Fen pasture of 24 acres, the high feeding character of which may be judged

from the fact that it is usually stocked with 150 sheep, 12 young beasts, and 4 young horses.

The turf was six inches deep, the soil having the appearance of good friable loam, dark-coloured, and somewhat clayey. There was no trace of rootlets on the deep face. Cut on July 16, the turf yielded :—

Gramineous herbage, 96 | Leguminous, 4 | Miscellaneous, a trace.

The leguminous herbage was exclusively *Trifolium repens*. Excepting a few leaves of *Bellis perennis*, the rest was grass, which gave on separation :—

<i>Lolium perenne</i>	42	<i>Avena flavescens</i>	2
<i>Dactylis glomerata</i>	23	<i>Poa trivialis</i>	1
<i>Agrostis stolonifera</i>	19	<i>Cynosurus cristatus</i>	1
<i>Triticum caninum</i>	4	Undetermined	5
<i>Holcus lanatus</i>	3		

No. 31.—Another turf sent by Mr. Harry Horrell. This was from one of the best pastures in Thorney; its area is 12 acres, and it is usually stocked with 10 large beasts and a mare and foal. In poor feeding-years, the cattle get 4 lb. of cake per head per day, but in good seasons the pasture will top up big cattle without artificial food.

The turf was seven and a half inches deep, and consisted of dark, friable soil, almost like leaf-mould. There was no trace of rootlets on the deep face. Cut on July 16, the herbage yielded :—

Gramineous herbage, 98 | Leguminous, 0 | Miscellaneous, 2.

The miscellaneous herbage consisted solely of *Achillea Millefolium*. The gramineous herbage separated into :—

<i>Alopecurus pratensis</i>	22	<i>Avena flavescens</i>	6
<i>Phleum pratense</i>	19	<i>Triticum caninum</i>	4
<i>Dactylis glomerata</i>	15	<i>Poa trivialis</i>	3
<i>Agrostis stolonifera</i>	14	<i>Festuca ovina</i> et var.	a trace
<i>Lolium perenne</i>	13	Undetermined	4

No. 32.—A turf sent by Messrs. Horrell Brothers, from their farm, Manea, Isle of Ely, Cambridgeshire. This farm has long been celebrated, and is well known as having been occupied by Mr. Plowright before he went to Pinchbeck. The specimen was taken from a field which always fattens a beast to the acre without corn, and is quite equal to the best Thorney pasture.

The turf was dug nine inches deep, and the soil had the appearance of a rich, adhesive loam, cold, very black, and slightly stony. Root-fibres were abundant on the deep face. The turf yielded :—

Gramineous herbage, 86 | Leguminous, 12½ | Miscellaneous, 1½

The leguminous herbage was exclusively *Trifolium repens*, whilst the miscellaneous herbage was made up of *Cerastium triviale*, *Ranunculus bulbosus*, and a trace of *Carex* sp. The grasses consisted of :—

<i>Lolium perenne</i>	37	<i>Alopecurus pratensis</i>	4
<i>Agrostis</i> sp.	24	<i>Poa trivialis</i>	3
<i>Dactylis glomerata</i>	16	<i>Cynosurus cristatus</i>	3
<i>Phleum pratense</i>	9	<i>Festuca ovina</i> et var.	a trace
		Undetermined	4

Both *Agrostis vulgaris* and *A. stolonifera* were present.

My thanks are due to Professor W. J. Malden for turfs 29, 30, 31, 32.

No. 33.—A turf sent by Mr. Richard Stratton, The Duffryn, Newport, Monmouthshire, who writes that it is "from a very excellent piece of land that has been grazed every year, I should think, from time immemorial. The soil is red loam resting on gravel." The turf was dug nine inches deep, and the soil had the appearance of a reddish, sticky loam; there was no sign of root-fibres on the deeper face. During growth, the herbage was noted to be of a rich grassy nature, and *Agrostis stolonifera* crept out to some extent around the sides. The proximate analysis gave:—

Gramineous herbage, 92 | Leguminous, 3 | Miscellaneous, 5.

The leguminous herbage was exclusively *Trifolium repens*. The miscellaneous herbage was mostly *Ranunculus repens* and *Ranunculus acris*, with a little *Cerastium triviale*. The separation of the gramineous herbage yielded:—

<i>Lolium perenne</i>	61	<i>Poa trivialis</i>	2
<i>Agrostis stolonifera</i>	23	<i>Phleum pratense</i>	a trace
<i>Cynosurus cristatus</i>	8	Undetermined	6

No. 34.—A turf sent by Mr. W. A. Watson-Armstrong, Craggside, Rothbury, Northumberland. It was dug from an old pasture called the "Blacklands," on Lord Armstrong's estate, and there is no record of its ever having been ploughed up. The turf was nine inches deep, and the soil had the appearance of a brownish, friable loam, whilst there was no trace of roots on the under surface. The herbage, cut on July 19, gave on separation:—

Gramineous herbage, 87 | Leguminous, a trace | Miscellaneous, 13.

The leguminous herbage was made up exclusively of *Trifolium repens*; whilst the miscellaneous herbage comprised *Achillea Millefolium*, *Ranunculus repens*, *Leontodon hispidus*, and *Cerastium triviale*. The separation of the gramineous herbage yielded:—

<i>Holcus lanatus</i>	29	<i>Phleum pratense</i>	3
<i>Lolium perenne</i>	26	<i>Cynosurus cristatus</i>	4
<i>Agrostis</i> sp.	10	<i>Dactylis glomerata</i>	2
<i>Poa annua</i>	7	<i>Avena elatior</i>	2
<i>Poa trivialis</i>	6	Undetermined	11

The *Agrostis* consisted largely of *A. vulgaris*.

No. 35.—A turf sent by Mr. T. Horrocks Miller, Singleton Park, Poulton-le-Fylde, Lancashire. It was dug from a pasture that has been down for thirty-five years, and has never been mown during that period, having been grazed throughout the whole time by milking-stock. The turf was cut nine inches deep, and the soil had the appearance of a very uniform reddish-brown, sandy loam, there being no trace of rootlets on the lower face. The turf yielded, on July 13:—

Gramineous herbage, 89 | Leguminous, 9 | Miscellaneous, 2.

The leguminous herbage consisted exclusively of *Trifolium repens*; whilst the small proportion of miscellaneous herbage was made up of *Ranunculus acris*, *Cerastium triviale*, and traces of *Bellis perennis* and *Sonchus*. The gramineous herbage gave on separation:—

<i>Lolium perenne</i>	58	<i>Cynosurus cristatus</i>	3
<i>Agrostis</i> sp.	20	<i>Festuca ovina</i> et var.	3
<i>Holcus lanatus</i>	9	<i>Dactylis glomerata</i>	2
<i>Poa trivialis</i>	3	Undetermined	2

Both *Agrostis stolonifera* and *A. vulgaris* were present.

No. 36.—A turf sent by Mr. Charles H. Eady, Home Farm, Ardington, near Wantage, Berkshire, from the estate of Lord Wantage, at the upper, or east end, of the Vale of White Horse. Mr. Eady writes:—

"I have forwarded a block of turf cut from a field bearing the best character of any in this immediate neighbourhood; it is 46 acres in size. The last week in April I stocked it with 44 Hereford steers and 4 shire fillies; the Herefords were all fat, and sold to a London dealer by the middle of July. I then drafted 86 other Herefords into it from inferior pasture; they were all fat and gone by the end of August. I then stocked it with 40 Shorthorn heifers; 20 of these were sold fat at the end of October, the remaining 20, being half-fat, were put in the stalls about the first week in November. I then put in 24 Welsh runts (stores), to clean it up, and they have (February 14), until quite recently, been doing well, when I moved them into strawyards. I have never known any artificial food of any sort given to beasts in this field."

The turf was dug nine inches deep, and the soil had the appearance of eight inches of strong loam resting upon an inch of very sticky, greyish clay; no rootlets were visible on the lower face. Cut on July 4, the turf yielded:—

Gramineous herbage, 66 | Leguminous, 34 | Miscellaneous, a trace.

The leguminous herbage consisted exclusively of *Trifolium repens*; whilst miscellaneous herbage was represented only by a few fragments of *Ranunculus bulbosus*. The gramineous herbage yielded on separation:—

<i>Lolium perenne</i>	72	<i>Poa trivialis</i>	2
<i>Agrostis stolonifera</i>	11	<i>Hordeum pratense</i>	2
<i>Cynosurus cristatus</i>	5	<i>Poa pratensis</i>	traces
<i>Phleum pratense</i>	2	<i>Alopecurus pratensis</i>	
<i>Holcus lanatus</i>	2	Undetermined	4

No. 37.—A turf sent by Mr. James Jefferies, Goosey, Faringdon, Berks. It was dug from Chapple Close, an old pasture which is known far and wide for its excellent feeding-properties, and is situated at the western end of the Vale of White Horse, between the hills and the border of the Thames; it is mostly fed with grazing-beasts, and is only known to have been mown once—about thirty years ago. The specimen was nine inches deep, and a few root-fibres were observable on the lower face. The soil was a dark brown, friable loam, becoming darker at the top, and free from stones throughout. The herbage was cut on July 6, and yielded:—

Gramineous herbage, 86 | Leguminous, 13 | Miscellaneous, 1.

Trifolium repens constituted the whole of the leguminous herbage, and the only miscellaneous species was *Ranunculus repens*. The grasses were:—

<i>Lolium perenne</i>	46	<i>Poa trivialis</i>	2
<i>Agrostis stolonifera</i>	36	<i>Festuca ovina</i> et var.	
<i>Alopecurus pratensis</i>	6	<i>Phleum pratense</i>	
<i>Dactylis glomerata</i>	5	Undetermined	5

No. 38.—A turf sent by Mr. James Hudson, Lowther, Penrith, from the North Park, at Lowther, Westmoreland. The land is on limestone. 600

feet above the sea-level, and it has had no manure or fertiliser of any kind applied to it for about fifteen years, but during that period it has been constantly grazed by cattle and sheep. There is no record of its ever having been ploughed, and there are no indications of ploughing to be seen on the surface. The turf was nine inches deep, and the soil had the appearance of a beautiful uniform red loam. No rootlets were visible on the deep face. When the herbage was cut, on July 27, the exposed turf was found to be somewhat mossy. It yielded:—

Gramineous herbage, 76 | Leguminous, 8 | Miscellaneous, 21.

The leguminous herbage was exclusively *Trifolium repens*. The miscellaneous herbage consisted mostly of *Rumex Acetosa*, with a little *Ranunculus acris*, *Cerastium triviale*, and *Carduus pratensis*. The gramineous herbage was separated into:—

<i>Agrostis</i> sp.	42	<i>Avena flavescens</i>	1
<i>Alopecurus pratensis</i>	20	<i>Festuca ovina</i> et var.	1
<i>Festuca pratensis</i>	12	<i>Poa trivialis</i>	1
<i>Holcus lanatus</i>	11	<i>Anthoxanthum odoratum</i> }	
<i>Cynosurus cristatus</i>	2	Undetermined	10

Both *Agrostis vulgaris* and *A. stolonifera* were present.

No. 39.—Wishing to get a turf from the Yoredale or Wensleydale district, I wrote to the Hon. G. E. Lascelles, Sion Hill, Thirsk, through whose kindness I received a turf from Mr. Thos. Willis, Manor House, Carperby, Bedale. The latter gentleman writes:—

“The field from which the turf was cut has been down in grass from time immemorial, and is a fair sample of the best grass-land in Wensleydale. It is thirty-five years since the last crop was cut for hay, and it has never been mown since. It will fatten off a full-grown beast and a sheep per acre.”

The turf, nine inches deep, afforded no traces of rootlets on its lower face. The soil was a soft, brownish, friable loam, slightly stony. Out on July 13, the very grassy herbage at that time was both rich and moist; it yielded:—

Gramineous herbage, 98 | Leguminous, a trace | Miscellaneous, 2.

Trifolium repens was the only leguminous species present; whilst the miscellaneous herbage was made up of *Ranunculus* sp., *Rumex Acetosa*, and insignificant fragments of *Conopodium denudatum*, *Cerastium triviale*, and *Cardamine pratense*. The grasses were:—

<i>Lolium perenne</i>	52	<i>Dactylis glomerata</i>	3
<i>Holcus lanatus</i>	20	<i>Cynosurus cristatus</i>	2
<i>Agrostis</i> sp.	16	Undetermined	4
<i>Poa trivialis</i>	3		

Both *Agrostis vulgaris* and *A. stolonifera* were present.

No. 40.—A turf sent by Mr. Harry J. Hildyard, Cherry Burton House, Hull, from the Holderness district of Yorkshire. The pasture is situated at Scorbrough, 4 miles north of Beverley, on the high road between that town and Driffield. The land has been in grass for 100 years or more, and there is no record of its having been mown. It is of fair feeding quality, and, with the aid of a little cake, beasts of large size have been sold off this pasture up to 70 and 80 stone of 14 lb.

The turf was dug eight and a half inches deep, and the soil had the appear-

ance of a ruddy brown, friable loam, very slightly plastic. There was no sign of rootlets on the deep face. Cut on July 15, the turf yielded:—

Gramineous herbage, 56 | Leguminous, a trace | Miscellaneous, 44.

The leguminous herbage was *Trifolium repens*. The miscellaneous herbage was characterised by a heavy mass of *Rumex Acetosa*, forming more than 40 per cent. of the weight of the entire herbage yielded by the turf. The rest was made up of *Cerastium triviale*, *Lathyrus sylvestris*, and fragments of species of *Ranunculus*, *Luzula*, and *Carduus*. The grasses were:—

<i>Lolium perenne</i>	40	<i>Cynosurus cristatus</i>	2
<i>Agrostis</i> sp.	39	<i>Anthoxanthum odoratum</i>	} . . . 1
<i>Holcus lanatus</i>	7	<i>Poa trivialis</i>	
<i>Alopecurus pratensis</i>	5	<i>Festuca ovina</i> et var.	
<i>Dactylis glomerata</i>	8	Undetermined	3

Both *Agrostis vulgaris* and *A. stolonifera* were present.

No. 41.—A turf sent by Mr. Stephen Cawley, Priestland, Tarporley, Cheshire, from the estate of Lord Tollamache. The land has been in grass forty years at least, and it is occasionally mown, the last time being about six years ago. On that occasion it received a good dressing of farmyard manure, and it has since then had 7 cwt. boiled bones per acre. It grows young stock well, and cows milk well upon it. The specimen was nine inches deep, and no root-fibres were visible on the lower face. The soil had the appearance of a dark red loam, slightly sticky and stony, and becoming darker towards the top. The turf, cut on July 24, gave:—

Gramineous herbage, 76 | Leguminous, 5 | Miscellaneous, 19.

Trifolium repens was the only leguminous species present. *Plantago lanceolata* constituted two-thirds of the miscellaneous herbage, the remainder being *Rumex Acetosa*, with a trace of *Ranunculus bulbosus*. The grasses were:—

<i>Lolium perenne</i>	49	<i>Poa trivialis</i>	2
<i>Alopecurus pratensis</i>	18	<i>Avena flavescens</i>	1
<i>Holcus lanatus</i>	12	<i>Festuca ovina</i> et var.	1
<i>Agrostis vulgaris</i>	6	<i>Cynosurus cristatus</i>	1
<i>Dactylis glomerata</i>	6	Undetermined	4

No. 42.—A turf sent by the Hon. Cecil T. Parker, Eaton Estate Office, Eccleston, Cheshire, from one of the best fields of Eaton Home Farm, on the estate of the Duke of Westminster. There is no record as to how long the pasture has been down, and it is used exclusively to graze dairy-cows. It is occasionally mown, the last time being in 1888. The land has received 5 cwt. of bones to the acre twice within the last five years. The specimen was dug seven inches deep, but there was no sign of rootlets on the lower face. The soil was a dirty yellowish-brown clay, becoming darker towards the top; it was free from stones. This was a very grassy turf, cut on July 6, it yielded:—

Gramineous herbage, 97 | Leguminous, 1 | Miscellaneous, 2.

The leguminous herbage in this case was *Trifolium pratense*. The miscellaneous ingredients were *Taraxacum*, *Plantago*, and *Ranunculus bulbosus*. The grasses gave on separation:—

<i>Lolium perenne</i>	75	<i>Poa trivialis</i>	1
<i>Agrostis stolonifera</i>	15	<i>Cynosurus cristatus</i>	1
<i>Holcus lanatus</i>	3	<i>Anthoxanthum odoratum</i>	a trace
<i>Phleum pratense</i>	2	Undetermined	3

No. 43.—A turf sent by Mr. W. Ernest Evans, School Gardens, Shrewsbury. It was cut from one of the best pastures in the Severn Valley, situated at Sutton Farm, Meole, near Shrewsbury, the property of Lord Berwick. There is no record of its having been mown within the memory of man.

This turf was ten inches deep, and there was no trace of rootlets on the lower face. The soil was a dull, reddish-brown loam, slightly clayey at the surface. Cut on July 18, the turf yielded:—

Gramineous herbage, 75 | Leguminous, 2 | Miscellaneous, 23.

The leguminous herbage was made up of *Trifolium repens*, with a trace of *Trifolium pratense*. Three-fourths of the miscellaneous herbage consisted of *Achillea Millefolium*, the remainder being *Plantago lanceolata* and a fragment of *Ranunculus*. The grasses gave on separation:—

<i>Lolium perenne</i>	48	<i>Cynosurus cristatus</i>	1
<i>Holcus lanatus</i>	34	<i>Anthoxanthum odoratum</i>	1
<i>Agrostis</i> sp.	6	<i>Festuca ovina</i> et var. }	1
<i>Dactylis glomerata</i>	4	<i>Poa trivialis</i>	3
<i>Alopecurus pratensis</i>	1	Undetermined	
<i>Avena flavescens</i>	1		

Agrostis vulgaris and *A. stolonifera* were both present.

No. 44.—For this and the next four specimens I am indebted to Messrs. Edward Webb & Sons, of Wordsley, Stourbridge. They were, through some misunderstanding, cut less than three inches deep; in fact, they were cut in the way turf is usually pared for transplanting or laying down again. However, I decided to use them, and the results are certainly interesting.

This specimen came from Mr. Evan Bebb, of Gravel Hill Farm, Shrewsbury, and was dug from one of his pastures which has been down at least fifty years. The soil was a clay loam. Cut on July 23, the turf yielded:—

Gramineous herbage, 79 | Leguminous, 3 | Miscellaneous, 18.

The leguminous herbage was nearly all *Trifolium pratense*, with a trace of *Trifolium repens*. Most of the miscellaneous herbage consisted of *Rumex Acetosa*, but there were also present *Cerastium triviale*, *Plantago lanceolata*, *Rhinanthus Crista-Galli*, and *Ranunculus acris*. The grasses yielded:—

<i>Lolium perenne</i>	55	<i>Festuca ovina</i> et var.	1
<i>Dactylis glomerata</i>	17	<i>Cynosurus cristatus</i>	1
<i>Holcus lanatus</i>	14	<i>Anthoxanthum odoratum</i>	1
<i>Agrostis</i> sp.	4	<i>Bromus mollis</i>	1
<i>Avena flavescens</i>	2	<i>Poa trivialis</i>	3
<i>Alopecurus pratensis</i>	2	Undetermined	

No. 45.—This also came from Gravel Hill Farm, off a good old pasture, differing from the preceding one in that it is liable to occasional flooding from the overflow of the Severn. The turf, mown on July 23, yielded:—

Gramineous herbage, 71 | Leguminous, 9 | Miscellaneous, 20.

Trifolium repens constituted the whole of the leguminous herbage; whilst the miscellaneous herbage was nearly all *Rumex Acetosa*, with a little *Ranunculus acris*. The gramineous ingredients were:—

<i>Lolium perenne</i>	51	<i>Festuca ovina</i> et var.	
<i>Agrostis</i> sp.	34	<i>Avena flavescens</i>	
<i>Holcus lanatus</i>	7	<i>Poa</i> sp.	2
		<i>Cynosurus cristatus</i>	
		<i>Anthoxanthum odoratum</i>	
		Undetermined	6

No. 46.—A turf from Sougar Grange, Stratford-on-Avon, Warwickshire. The pasture has been in existence from time immemorial; it was mown about ten years ago; it will feed one bullock per acre well. The soil was a reddish-brown, friable loam. The herbage, cut on July 10, gave:—

Gramineous herbage, 60 | Leguminous, 8 | Miscellaneous, 32.

Trifolium repens was the only leguminous species present. Of the miscellaneous species, *Leontodon* was most abundant; then came *Rumex Acetosa*, *Cerastium triviale*, *Taraxacum*, *Bellis*, and *Carex*. The grasses yielded:—

<i>Agrostis</i> sp.	42	<i>Cynosurus cristatus</i>	5
<i>Lolium perenne</i>	30	<i>Avena flavescens</i>	1
<i>Holcus lanatus</i>	11	Undetermined	6
<i>Alopecurus pratensis</i>	5		

Both *Agrostis vulgaris* and *A. stolonifera* were present.

No. 47.—This specimen came from Messrs. Webb's Kinver Hill Farm, Kinver, Staffordshire. It was taken from land that has been down a great number of years; though used for grazing cattle, it is frequently mown. Cut on July 23, the turf yielded:—

Gramineous herbage, 96 | Leguminous, 3 | Miscellaneous, 1.

Trifolium repens was the only leguminous species; whilst the miscellaneous herbage contained equal weights of *Ranunculus bulbosus* and *Plantago lanceolata*. The gramineous herbage on separation gave:—

<i>Dactylis glomerata</i>	42	<i>Avena flavescens</i>	2
<i>Lolium perenne</i>	35	<i>Festuca ovina</i> et var.	2
<i>Holcus lanatus</i>	6	<i>Agrostis</i> sp.	1
<i>Bromus mollis</i>	4	Undetermined	6
<i>Poa trivialis</i>	2		

No. 48.—This specimen was cut from land that has been in grass for generations at Caunsall Farm, Kidderminster, Worcestershire. The herbage was cut on July 22, and gave:—

Gramineous herbage, 86 | Leguminous, 2 | Miscellaneous, 12.

The only leguminous species was *Trifolium repens*. *Rumex Acetosa*, *Achillea Millefolium*, and *Ranunculus acris* were the chief components of the miscellaneous herbage, there being besides a little *Cerastium triviale* and *Cardamine pratensis*. The grasses were made up of:—

<i>Dactylis glomerata</i>	30	<i>Alopecurus pratensis</i>	1
<i>Lolium perenne</i>	28	<i>Cynosurus cristatus</i>	1
<i>Agrostis</i> sp.	14	<i>Poa trivialis</i>	1
<i>Festuca ovina</i> et var.	13	<i>Anthoxanthum odoratum</i>	1
<i>Holcus lanatus</i>	9	Undetermined	3

No. 49.—I have to thank the Hon. Cecil T. Parker for suggesting to me the examination of this and the pasture next referred to; and I am indebted to Mr. E. P. Squarey, The Moot, Downton, for the introduction which enabled me to get the two specimens. Mr. Parker, in writing to me, referred to "some notorious pastures near Ilchester capable," so report said, "of feeding a bullock and two sheep per acre!" Both specimens are from the estate of Mr. Kenelm Wingfield-Digby, Sherborne Castle, Dorset, and were sent to me by Mr. W. F. Rawlins, Limington, Ilchester, who wrote: "The field from which this was dug is one of the best grazing-grounds near here; it is very forcing, but not at all tart." The specimen was dug eight inches deep, and

no root-fibres could be seen on the lower face. The soil was a loose, friable loam of light chocolate colour. Cut on July 15, the herbage yielded:—

Gramineous herbage, 88 | Leguminous, 1 | Miscellaneous, 11.

The leguminous herbage was made up of *Trifolium repens*, and the sole miscellaneous species was a coarse, heavy plant of *Carduus*.

The grasses were thus constituted:—

<i>Lolium perenne</i>	66	<i>Avena flavescens</i>	
<i>Agrostis</i> sp.	17	<i>Holcus lanatus</i>	2
<i>Dactylis glomerata</i>	6	<i>Poa trivialis</i>	
<i>Phleum pratense</i>	4	Undetermined	3
<i>Cynosurus cristatus</i>	2		

The *Agrostis* was mostly *A. stolonifera*.

No. 50.—This specimen came from the “teart,” or “tart” land at Ilchester, so called because animals grazed upon it soon begin to scour. A comparison of the botanical analysis of this with that of the preceding turf is very instructive.

This “tart” turf, cut on July 16, yielded on separation a result which can only be expressed as follows:—

Gramineous herbage, 100 | Leguminous, a trace | Miscellaneous, a trace.

Excepting for very insignificant quantities of *Trifolium repens*, *Cerastium triviale*, and *Ranunculus*, the herbage was exclusively grassy. The graminous components were, on separation, found to be:—

<i>Lolium perenne</i>	43	<i>Avena flavescens</i>	1
<i>Holcus lanatus</i>	20	<i>Poa trivialis</i>	
<i>Dactylis glomerata</i>	13	<i>Festuca loliacea</i>	3
<i>Bromus mollis</i>	8	<i>Festuca ovina</i> et var.	
<i>Agrostis</i> sp.	7	Undetermined	5

No. 51.—As my experiments were conducted in South Hants, though within a mile of the border of South Wilts, I deemed it desirable to fence off a small portion of the best old pasture on the farm, and subsequently to cut from the middle of it the herbage covering an area of 2 square feet. Hampshire is not a county notorious for the high quality of its pasturage, but the field called the “Paddock” from which the sample was taken, has been in grass beyond the memory of man, and it is never mown, but is largely grazed by young stock. The herbage was cut on July 30, and yielded:—

Gramineous herbage, 90 | Leguminous, 1 | Miscellaneous, 9.

The leguminous herbage was *Trifolium repens*, with a trace of *Trifolium pratense*. The miscellaneous herbage was chiefly *Achillea Millefolium*, with very small quantities of *Plantago lanceolata*, *Leontodon*, *Cerastium*, *Ranunculus*, and *Rumex Acetosa*. The grasses separated into:—

<i>Agrostis</i> sp.	46	<i>Cynosurus cristatus</i>	2
<i>Lolium perenne</i>	36	<i>Avena flavescens</i>	1
<i>Phleum pratense</i>	5	<i>Anthoxanthum odoratum</i>	1
<i>Holcus lanatus</i>	4	<i>Poa trivialis</i>	
<i>Festuca ovina</i> et var.	2	Undetermined	3

No. 52.—A turf sent by Mr. R. Crosswell Ward, Neasham Hill, Darlington, from a field on his own estate that has been in grass for about a century. It has been mown for the last ten years, and has received liberal manuring. The

specimen was dug seven inches deep, and the soil—a micaceous, brown, sandy loam—was somewhat infested with wireworm. The turf, cut July 17, gave:—

Gramineous herbage, 61 | Leguminous, 3 | Miscellaneous, 36.

The leguminous herbage was *Trifolium repens*, with the merest trace of *Trifolium pratense*. *Rumex Acetosa* constituted by far the greater part of the miscellaneous herbage, the remainder comprising *Plantago lanceolata*, *Prunella vulgaris*, *Ranunculus acris*, with fragments of *Luzula campestris*, *Cerastium*, and *Veronica*. The grasses separated into:—

<i>Holcus lanatus</i>	46	<i>Poa trivialis</i>	
<i>Lolium perenne</i>	23	<i>Festuca ovina</i> et var.	} . . . 3
<i>Agrostis</i> sp.	17	<i>Anthoxanthum odoratum</i>	
<i>Avena flavescens</i>	5	Undetermined	4
<i>Cynosurus cristatus</i>	2		

No. 53.—This and the next turf were sent by Messrs. James Carter & Co., High Holborn. They both came from Dedham, Essex—this one from upland, and the following one from marsh-land. The upland grass has been down for many years; it is mown every alternate year, it receives no manure, and it feeds a bullock per acre per year. The specimen was dug only six inches deep, and the soil was a gravelly sand, somewhat adhesive. The turf was mown on July 24, and yielded:—

Gramineous herbage, 65 | Leguminous, 10 | Miscellaneous, 25.

Four-fifths of the leguminous herbage was *Trifolium repens*, the remainder being *Lotus corniculatus* and *Trifolium pratense*. The miscellaneous herbage was nearly all *Rumex Acetosa*, but *Plantago lanceolata*, *Ranunculus*, and *Cerastium* were also present. The grasses consisted of:—

<i>Lolium perenne</i>	46	<i>Anthoxanthum odoratum</i>	3
<i>Holcus lanatus</i>	13	<i>Poa</i> sp.	2
<i>Dactylis glomerata</i>	10	<i>Avena flavescens</i>	} . . . a trace
<i>Agrostis</i> sp.	7	<i>Festuca ovina</i> et var.	
<i>Alopecurus pratensis</i>	7	Undetermined	7
<i>Cynosurus cristatus</i>	6		

No. 54.—The turf from Dedham Marsh came from land that has been in grass for many years, no person in the district remembering it otherwise. It is mown every alternate summer. No manure is applied to it, and no cake is fed upon it. The grass is usually grazed by bullocks, and in spring the land is harrowed and rolled. The marsh is described as “heavy land, subject to floods.” The specimen was cut five inches deep, and the soil was a gravelly sand. Cut on July 24, the turf yielded:—

Gramineous herbage, 59 | Leguminous, 8 | Miscellaneous, 33.

The greater part of the leguminous herbage was *Trifolium repens*, but there was also some *Trifolium minus*. *Rumex Acetosa* was by far the most abundant miscellaneous species, there being likewise *Leontodon*, *Taraxacum*, *Achillea*, *Ranunculus*, *Cerastium*, and *Bellis*. The grasses gave:—

<i>Holcus lanatus</i>	32	<i>Bromus mollis</i>	4
<i>Alopecurus pratensis</i>	28	<i>Avena flavescens</i>	2
<i>Lolium perenne</i>	17	<i>Dactylis glomerata</i>	4
<i>Agrostis</i> sp.	5	<i>Festuca ovina</i> et var.	2
<i>Anthoxanthum odoratum</i>	4	Undetermined	2

WELSH PASTURES.

No. 55.—A turf sent by Mr. Charles S. Mainwaring, Galtfaenan, Denbighshire, from the fertile Vale of Clwyd. Mr. Mainwaring describes it as:—

“A piece of our best turf, from the best feeding-pasture I know in the district, and which has, I should think, been in pasture 100 years or more. It at one time received a portion of the sewage of a town two miles off.”

The turf was nine inches deep, and there was no trace of rootlets on the lower face. The soil was a rich, brown, friable loam, more clayey near the surface. The turf threw up a rich, grassy herbage, and, cut July 4, yielded:—

Gramineous herbage, 90 | Leguminous, 2 | Miscellaneous, 8.

The leguminous herbage was exclusively *Trifolium repens*. The miscellaneous herbage was chiefly *Leontodon hispidus*, the remainder being *Ranunculus acris* and *Bellis perennis*. The grasses gave:—

<i>Lolium perenne</i>	85	<i>Poa</i> sp.	1
<i>Agrostis stolonifera</i>	6	<i>Hordeum pratense</i>	a trace
<i>Cynosurus cristatus</i>	3	Undetermined	5

No. 56.—A turf sent by Mr. D. Williams, Gorrddinog, Llanfairfechan, Carnarvonshire, from the estate of Colonel Henry Platt. It was cut from the middle of one of the best old pasture-fields laid down about twenty or twenty-two years ago. The turf was nine inches deep, and no root-fibres could be seen on the lower face. The soil was a greyish loam, somewhat adhesive and stony. Cut on July 22, the turf yielded:—

Gramineous herbage, 46 | Leguminous, 15 | Miscellaneous, 39.

The leguminous herbage was *Trifolium repens*, with a trace of *Trifolium minus*. The miscellaneous herbage was nearly all made up of *Plantago lanceolata*, with very small quantities of *Ranunculus bulbosus*, *Cerastium triviale*, and *Bellis perennis*. The grasses gave on separation:—

<i>Festuca ovina</i> et var.	35	<i>Alopecurus pratensis</i>	1
<i>Holcus lanatus</i>	27	<i>Poa trivialis</i>	1
<i>Lolium perenne</i>	23	<i>Avena flavescens</i>	1
<i>Agrostis vulgaris</i>	2	Undetermined	8
<i>Cynosurus cristatus</i>	2		

No. 57.—A turf sent by Mr. J. Maitland, The Home Farm, Tan-y-Bwlch, Merionethshire, bailiff to Mr. W. E. Oakley. It is from the richest and best pasture in the valley, resting upon land which was reclaimed, drained, and improved over twenty years ago. The pasture has never been broken up or seeded down, so that it is the natural herbage of the soil.

The turf, nine inches deep, showed no traces of root-fibres on its lower face. The soil was a very dark brown, friable loam, with a somewhat peaty appearance, and slightly ferruginous. Cut on July 20, the turf yielded:—

Gramineous herbage, 76 | Leguminous, a trace | Miscellaneous, 24.

Trifolium repens was the only leguminous species present. The miscellaneous herbage was practically all *Rumex Acetosa*, there being besides merely traces of *Cerastium* and *Ranunculus*. The grasses were:—

<i>Lolium perenne</i>	50	<i>Poa trivialis</i>	
<i>Agrostis</i> sp.	21	<i>Cynosurus cristatus</i>	1
<i>Holcus lanatus</i>	21	<i>Anthoxanthum odoratum</i>	
<i>Alopecurus pratensis</i>	5	Undetermined	2

Both *Agrostis vulgaris* and *A. stolonifera* were present.

No. 58.—A turf sent by Mr. Bevan Bowen, Llwyngwair, Crymmych R.S.O., from Cardiganshire.

"It was cut from a permanent grass-field on Berry Hill Farm, near Newport, Pembrokeshire, which has not been under the plough for a century, if ever. Hay was taken from it in 1887, and, during many years, it has been mown, but not oftener than in alternate years. The field is very near the sea, and about 90 feet above sea-level. It has had no top-dressing for many years, and has been grazed by cattle (not cows), sheep, and colts, during the last decade, and contains about 24 acres of land. Oxen certainly get fat on it, and it yields somewhere about two tons of hay per acre."

The turf was nine inches deep, and a few root-fibres were visible on the lower face. The soil had the appearance of a light brown, friable loam. The turf produced a mixed herbage, and when mown it was seen to be rather mossy beneath. It gave:—

Gramineous herbage, 76 | Leguminous, 4 | Miscellaneous, 20.

The leguminous herbage was composed of about equal quantities of *Trifolium pratense* and *Trifolium repens*. The miscellaneous herbage was chiefly *Plantago lanceolata*, with much smaller proportions of *Ranunculus acris*, *Prunella vulgaris*, *Cerastium triviale*, *Rumex Acetosa*, and *Bellis perennis*. The grasses separated into:—

<i>Agrostis</i> sp.	39	<i>Anthoxanthum odoratum</i> . . .	1
<i>Holcus lanatus</i>	28	<i>Cynosurus cristatus</i>	1
<i>Lolium perenne</i>	24	Undetermined	7

No. 59.—A turf sent by Mr. W. B. Roberts, Loveston, Pembroke, from a field that has been in pasture for at least 100 years, and probably much longer. It was dug from an average field of the farm, resting upon limestone rock, and it has been mown alternately for the last twenty years, and every alternate year grazed with dairy-stock; in 1888 it was mown.

The turf was eight inches deep, and a few root-fibres were noticeable on the lower face. The soil was a red, friable loam, rather stony. The turf threw up a somewhat mixed herbage, which, cut on July 20, yielded:—

Gramineous herbage, 73 | Leguminous, 3 | Miscellaneous, 24.

The leguminous herbage consisted in great part of *Trifolium pratense*, the remainder being *Trifolium repens*, with a little *Trifolium minus*. Of the miscellaneous species, *Cerastium triviale* was most abundant, this being followed, in order, by *Leontodon hispidus*, *Rumex Acetosa*, *Plantago lanceolata*, *Achillea Millefolium*, *Prunella vulgaris*, *Veronica Chamædrys*, and *Potentilla* sp. The grasses were thus made up:—

<i>Lolium perenne</i>	27	<i>Bromus mollis</i>	2
<i>Agrostis</i> sp.	22	<i>Poa trivialis</i>	2
<i>Dactylis glomerata</i>	22	<i>Festuca ovina</i> et var.	1
<i>Holcus lanatus</i>	19	<i>Anthoxanthum odoratum</i>	1
<i>Cynosurus cristatus</i>	8	Undetermined	2

Both *Agrostis vulgaris* and *A. stolonifera* were present.

No. 60.—A turf sent by Mr. J. Broekie, Golden Grove, Carmarthenshire, from the estate of Earl Cawdor in the Vale of Towy. There is no record as to how long the land has been in grass, and it has not been mown for many years, if ever. It is not manured very often, being pastured by sheep and young cattle, fed with roots and corn, and a little cake at times. The pasture will carry 1 ox, or 4 young sheep, per acre.

The turf was nine inches deep, and there was no sign of rootlets on the lower face. The soil consisted of four inches of clayey loam, resting upon a reddish, friable loam. Cut on July 6, the turf yielded:—

Gramineous herbage, 86 | Leguminous, a trace | Miscellaneous, 14.

The small amount of leguminous herbage consisted of *Trifolium repens*. The miscellaneous herbage was mostly *Rumex Acetosa*, but there were also present *Achillea Millefolium*, *Ranunculus acris*, *Cerastium triviale*, and *Cardamine pratense*. The gramineous herbage consisted of:—

<i>Lolium perenne</i>	56	<i>Poa</i> sp.	2
<i>Agrostis stolonifera</i>	19	<i>Cynosurus cristatus</i>	1
<i>Holcus lanatus</i>	12	Undetermined	7
<i>Anthoxanthum odoratum</i>	3		

Both *Poa trivialis* and *Poa pratensis* were present.

For several of the Welsh specimens I am indebted to the introduction of Dr. W. B. Wall, Pembroke.

SCOTCH PASTURES.

No. 61.—A turf sent by Mr. D. D. Stewart, Rossie Priory, Inchture, Dundee, Forfarshire. It was dug from a pasture in the eastern division of the Carse of Gowrie. The whole nine inches' depth of soil presented the appearance of a rich, brown, friable loam, slightly pebbly. There was no trace of severed rootlets on the lower surface. The herbage was cut on July 5, and yielded:—

Gramineous herbage, 61 | Leguminous, 19 | Miscellaneous 20.

The leguminous herbage was made up exclusively of *Trifolium repens*, and the miscellaneous herbage of *Ranunculus repens*. The gramineous herbage was thus made up—

<i>Lolium perenne</i>	54	<i>Alopecurus pratensis</i>	1
<i>Agrostis</i> sp.	28	<i>Poa pratensis</i>	traces
<i>Poa trivialis</i>	12	Undetermined	5

The *Agrostis* was mostly *A. stolonifera*, with a little *A. vulgaris*.

No. 62.—A turf sent by Mr. George Gowe, Balhousie, Carnoustie, Forfarshire. The turf was nine inches deep, and the soil had the appearance of a dry, reddish-brown, micaceous, sandy loam, free from stones. No root-fibres were visible on the deep face. Cut on July 4, the herbage yielded:—

Gramineous herbage, 88 | Leguminous, 9 | Miscellaneous, 3

The leguminous herbage was composed exclusively of *Trifolium repens*, whilst the miscellaneous herbage consisted of equal parts of *Ranunculus repens* and *Rumex Acetosa*. The gramineous herbage gave:—

<i>Agrostis stolonifera</i>	75	<i>Dactylis glomerata</i>	a trace
<i>Poa trivialis</i>	10	Undetermined	10
<i>Lolium perenne</i>	5		

The extent to which *Agrostis stolonifera* crept out all round this turf was as instructive as it was striking.

No. 63.—A turf sent by Sir James T. Stewart Richardson, Bart., Pitfour Castle, Perth. This is in the western division of the Carse of Gowrie. This turf has not been broken within the memory of the oldest inhabitant. The specimen was seven inches deep; it had the appearance of a moist, brown, friable loam, and there were a few root-fibres and two coarse roots (probably

of *Rumex*) cut on the lower surface. The herbage was unusually fine-leaved, and when cut on July 27, the exposed turf was seen to be slightly mossy. The proximate analysis gave:—

Gramineous herbage, 76 | Leguminous, 8 | Miscellaneous, 16.

The leguminous herbage was made up exclusively of *Trifolium repens*. Of the miscellaneous herbage, four-fifths was *Ranunculus repens*, and the remainder was made up of *Prunella vulgaris*, *Cerastium triviale*, and *Rumex* sp. The gramineous herbage yielded the following results:—

<i>Festuca ovina</i> et var.	39	<i>Anthoxanthum odoratum</i>	
<i>Agrostis</i> sp.	29	<i>Avena flavescens</i>	3
<i>Holcus lanatus</i>	14	<i>Festuca pratensis</i>	
<i>Dactylis glomerata</i>	11	Undetermined	3
<i>Cynosurus cristatus</i>	1		

The *Agrostis* was chiefly *A. vulgaris*, with a little *A. stolonifera*. The great abundance of the narrow-leaved fescues and of *Agrostis vulgaris* will readily account for the fine herbage which appeared to predominate upon this turf.

No. 64.—Another turf from the same place, but taken from land which Sir James Richardson states was laid down in 1832, so that the pasture is fifty-seven years old. The proximate separation gave:—

Gramineous herbage, 80 | Leguminous, 10 | Miscellaneous, 10.

The leguminous herbage consisted exclusively of *Trifolium repens*, whilst the miscellaneous herbage was nearly all *Carduus*, with a little *Ranunculus repens* and *Rumex* sp. The gramineous herbage yielded:—

<i>Alopecurus pratensis</i>	39	<i>Anthoxanthum odoratum</i>	
<i>Agrostis</i> sp.	33	<i>Poa trivialis</i>	2
<i>Festuca ovina</i> et var.	16	<i>Holcus lanatus</i>	
<i>Cynosurus cristatus</i>	2	Undetermined	6
<i>Avena flavescens</i>	2		

The most noteworthy differences between these two turfs are that the one from the more modern pasture yielded *Alopecurus pratensis*, whilst that from the older one did not; whereas that from the older pasture afforded *Dactylis glomerata*, which did not show itself upon the younger turf.

No. 65.—A turf sent by Captain J. S. Black, Balgowan, Perthshire, from a feeding-pasture which was sown down nearly forty years ago. Captain Black writes that his grass-lands have a high reputation in their district. He adds, about this grass-land:—

"Some of it has not been broken up within the memory of anyone living, but the greater part of it (according to the custom of the country) is allowed to lie in grass for about thirty years, more or less, and then it is put through a course of cropping of four or five years. One 23-acre field after such a course, and after being sown down with grass in the summer of 1887, was let for the grazing season of 1888 for 70*l*."

The turf was nine inches deep, the soil having the appearance of a reddish-brown, medium loam; the deep face showed no trace of rootlets. The herbage was cut on July 5, and yielded:—

Gramineous herbage, 56 | Leguminous, 3 | Miscellaneous, 41.

The leguminous herbage was made up entirely of *Trifolium repens*. The miscellaneous herbage consisted for the greater part of *Ranunculus acris*, the remainder being *Ranunculus repens*, *Cerastium triviale*, and *Taraxacum*. The separation of the gramineous herbage gave the following results:—

<i>Lolium perenne</i>	29	<i>Holcus lanatus</i>	16
<i>Agrostis</i> sp.	27	<i>Anthoxanthum odoratum</i>	1
<i>Poa trivialis</i>	16	Undetermined	11

No. 66.—A turf sent by Sir Geo. Macpherson Grant, Bart., The Castle, Ballindalloch, Morayshire. It was eight and a half inches deep, and presented the appearance of a dark grey, sandy loam. No trace of rootlets was discernible on the under face. It grew a very grassy herbage, which was, however, plentifully interspersed with *Cerastium triviale*. Cut on July 6, the herbage yielded, on proximate analysis:—

Gramineous herbage, 90 | Leguminous, 2 | Miscellaneous, 8.

The small quantity of leguminous herbage was made up entirely of *Trifolium repens*. The miscellaneous herbage was mostly *Cerastium triviale*, with a trace of *Ranunculus repens*. The gramineous herbage yielded:—

<i>Holcus lanatus</i>	30	<i>Cynosurus cristatus</i>	4
<i>Lolium perenne</i>	26	<i>Poa trivialis</i>	2
<i>Agrostis</i> sp.	24	Undetermined	7
<i>Alopecurus pratensis</i>	7		

No. 67.—A turf sent by Mr. Lewis Beaton, the Home Farm, Cullen House, Cullen, Banffshire, from a pasture twenty-three years old, on the Countess of Seaforth's estate. It was dug nine inches deep, and consisted of a black, micaceous, sandy loam, with fragments of micaceous sandstone. No rootlets could be seen on the deep face. The herbage, cut on July 4, consisted of:—

Gramineous herbage, 67 | Leguminous, 33 | Miscellaneous, 0.

The leguminous herbage, which made up just one-third of the whole, was all *Trifolium repens*. The gramineous herbage was remarkable for the small number of species entering into it:—

<i>Poa trivialis</i>	60	<i>Holcus lanatus</i>	5
<i>Agrostis stolonifera</i>	23	Undetermined	7

The *Agrostis* crept out conspicuously upon the bare soil around the turf.

No. 68.—A turf sent by Mr. W. H. Lumsden, Balmedie, Aberdeenshire, who writes:—

"It was taken from a field which has been in grass for nine years, and always pastured. The field is one of deep mould, and lies exposed to the sea, and about one mile, or rather less, from it."

The turf was nine inches deep, and the soil had the appearance of a dirty brown, stony, plastic clay. There was no trace of rootlets on the deep face. Cut on July 3, the turf yielded:—

Gramineous herbage, 41 | Leguminous, a trace | Miscellaneous, 59.

Of leguminous herbage, nothing save a solitary leaf of *Trifolium repens* was detected. The miscellaneous herbage was made up entirely of *Ranunculus repens*, which crept out in a very characteristic manner on every side of the turf. The gramineous herbage was thus made up:—

<i>Lolium perenne</i>	61	<i>Agrostis stolonifera</i>	2
<i>Dactylis glomerata</i>	18	<i>Poa annua</i>	a trace
<i>Poa trivialis</i>	8	Undetermined	5
<i>Cynosurus cristatus</i>	6		

No. 69.—A turf sent by Mr. Geo. Riddell, Corsehope, Heriot, Midlothian, who writes that it is "from a field laid down into permanent pasture twenty-five years ago by the late Charles Lawson, who farmed his own property at that time, and who was well known as the first seedsman in Britain then. The elevation of the field will be about 900 to 1,000 feet above sea-level." The soil appeared to be a friable, stony loam; the turf was only six inches deep, the soil being too loose to permit of a greater depth. It was a very grassy turf, and yielded after cutting on July 5:—

Gramineous herbage, 90 | Leguminous, a trace | Miscellaneous, 10.

Leguminous herbage was represented by merely a few leaves of *Trifolium repens*. Half the miscellaneous herbage was made up of *Ranunculus repens*, the remainder consisting of compositaceous species of *Carduus*, *Sonchus*, and *Leontodon*. The gramineous herbage was thus made up:—

<i>Agrostis stolonifera</i>	74		<i>Poa trivialis</i>	2
<i>Cynosurus cristatus</i>	6		<i>Poa pratensis</i>	a trace
<i>Festuca ovina</i> et var.	5		Undetermined	9
<i>Lolium perenne</i>	4			

Three-fourths of the grass, then, was *Agrostis stolonifera*, which crept out around the turf in a most luxuriant fashion.

No. 70.—A turf sent by Mr. C. M. Patterson, Eskside House, Dalkeith, Midlothian, from the Marquis of Lothian's estate at Newbattle. Mr. Patterson writes that it is "a sample of our grazing-land," but that "it is not what can be called feeding-land, being light and porous." The turf was nine inches deep, and had the appearance of a very dark brown, sandy loam, with crystalline particles (mica?) and black, scoriaceous, or cindery fragments. Cut on July 29, the herbage yielded:—

Gramineous herbage, 82 | Leguminous, 5 | Miscellaneous, 13.

The leguminous herbage consisted exclusively of *Trifolium repens*; whilst five-sixths of the miscellaneous herbage was *Prunella vulgaris*, and the remainder *Ranunculus acris* and *Ranunculus repens*. The grasses were:—

<i>Holcus lanatus</i>	36		<i>Festuca ovina</i> et var.	2
<i>Alopecurus pratensis</i>	25		<i>Lolium perenne</i>	1
<i>Agrostis</i> sp.	23		<i>Phleum pratense</i>	a trace
<i>Cynosurus cristatus</i>	6		Undetermined	7

No. 71.—A turf sent by Mr. Thomas Gibson, Haymount, Kelso, Roxburghshire, who writes:—"It is taken from a field of old pasture laid down more than thirty years ago. It grazes well, keeping more than a bullock to the imperial acre. It was cut for hay about twelve years ago, and was again cut last year. When in bloom I had it examined by a botanist, who was much surprised to find a very large proportion of perennial rye-grass in it, showing that a fine old sward contains that grass in a much larger proportion than modern authorities admit." The turf was nine inches deep, and the soil had the appearance of a reddish-brown, friable loam, somewhat stony. No rootlets were visible on the under surface. Cut on July 12, the herbage yielded:—

Gramineous herbage, 99 | Leguminous, a trace | Miscellaneous, 1.

As these figures show, the herbage was almost exclusively grass, there being besides only a few fragments of *Trifolium repens* and a small quantity of *Taraxacum*. The gramineous herbage was made up of:—

<i>Agrostis stolonifera</i>	50	<i>Poa trivialis</i>	9
<i>Lolium perenne</i>	27	<i>Cynosurus cristatus</i>	a trace
<i>Holcus lanatus</i>	9	Undetermined	5

Here, again, *Agrostis stolonifera* crept out all round the sides of the turf. As corroborative of Mr. Gibson's letter, it will be seen that more than one-fourth of the herbage was rye-grass.

No. 72.—A turf sent by Mr. Neil M'Kenzie, Holestane, Thornhill, Dumfriesshire, from the Drumlanrig estate. It consisted of nine inches' depth of a brownish-yellow, friable loam, not sticky, and with no trace of root-lets on the under surface. It threw up a very mixed herbage, which, when cut on July 12, was thin, weedy, and somewhat mossy beneath. The proximate separation yielded:—

Gramineous herbage, 35 | Leguminous, 1 | Miscellaneous, 64.

The very small proportion of leguminous herbage consisted entirely of *Trifolium repens*. Half of the miscellaneous herbage was *Rumex* sp.; a fourth part was made up jointly of *Leontodon* and *Taraxacum*; and one-eighth part consisted of *Plantago lanceolata*; the remainder being, in order of abundance, *Ranunculus repens*, *Cerastium triviale*, *Veronica Chamaedrys*, *Prunella vulgaris*, *Potentilla Anserina*, *Luzula campestris*, and *Cardamine pratense*. The gramineous herbage was thus composed:—

<i>Holcus lanatus</i>	34	<i>Cynosurus cristatus</i>	6
<i>Agrostis</i> sp.	33	<i>Poa trivialis</i>	3
<i>Lolium perenne</i>	7	Undetermined	10
<i>Festuca pratensis</i>	7		

Agrostis stolonifera and *A. vulgaris* were about equally abundant.

My thanks are due to Mr. David Young, of the *North British Agriculturist*, for helping me to get the Scotch specimens.

IRISH PASTURES.

No. 73.—A turf sent by Mr. David Harper, Ballely Cottage, Randalstown, County Antrim, who writes:—

"The land from which it was taken has been in pasture nearly a hundred years, and is excellent for producing beef and milk. It is not drained. The sub-soil is brown, overlying a hard, black whinstone."

The turf was nine inches deep, and a delicate network of root-fibres was noticeable on the lower face. The soil was a reddish-brown, medium loam, interspersed with fragments of a black shaly character. From the outset the turf appeared to be weedy, and it yielded, when cut on July 17:—

Gramineous herbage, 54 | Leguminous, 2 | Miscellaneous, 44.

The leguminous herbage was *Trifolium repens*; whilst the miscellaneous herbage was chiefly made up of *Plantago lanceolata* and *Leontodon hispidus*, there being also, however, much smaller quantities of *Taraxacum* sp., *Ranunculus repens*, *Ranunculus acris*, *Bellis perennis*, *Rumex Acetosa*, *Cardamine pratense*, *Prunella vulgaris*, and *Luzula campestris*. The grasses were made up of:—

<i>Agrostis</i> sp.	39	<i>Alopecurus pratensis</i>	4
<i>Lolium perenne</i>	34	<i>Anthoxanthum odoratum</i>	1
<i>Holcus lanatus</i>	10	<i>Poa</i> sp.	1
<i>Cynosurus cristatus</i>	8	Undetermined	4

The *Agrostis* was mostly *A. stolonifera*.

No. 74.—A turf sent by Mr. George Hewson, Ennismore, Listowel, Co. Kerry, from a pasture which has been grazed by dairy-cows for the last forty years, and yields the best butter for the London market.

The turf was nine inches deep, and there was no sign of rootlets on the lower face. The soil had the appearance of a dirty yellowish-brown, friable loam, containing large water-worn pebbles and many earthworms. The specimen when received was at once seen to be very weedy, and the herbage, cut on July 12, gave:—

Gramineous herbage, 33 | Leguminous, 1 | Miscellaneous, 66,

About one-fourth of the leguminous herbage was *Trifolium repens*, and the rest was *Trifolium pratense*. Rather more than half of the miscellaneous herbage was *Achillea Millefolium*, and the greater part of the remainder was *Leontodon hispidus*. There were also present, *Rumex Acetosa*, *Plantago lanceolata*, *Carduus*, *Prunella vulgaris*, *Cerastium triviale*, and *Bellis perennis*. The grasses yielded:—

<i>Lolium perenne</i>	61	<i>Anthoxanthum odoratum</i>	1
<i>Agrostis</i> sp.	19	<i>Poa pratensis</i>	a trace
<i>Holcus lanatus</i>	8	Undetermined	9
<i>Cynosurus cristatus</i>	2		

The *Agrostis* was chiefly *A. stolonifera*.

No. 75.—A turf sent by Mr. William Young, Brockley Park, Stradbally, Queen's Co. It was cut from a first-rate old pasture, resting upon deep alluvial soil, near the Stradbally River. The land has never been broken up within the memory of man.

The turf was nine inches deep, and the lower face showed no traces of rootlets. The soil had the appearance of a dark brown, friable loam, and was slightly stony. The growth was of a rich, grassy character, and when cut, on July 5, it yielded:—

Gramineous herbage, 97 | Leguminous, 2 | Miscellaneous, 1.

The leguminous herbage was *Trifolium repens*, and the small proportion of miscellaneous ingredients included *Ranunculus repens*, *Cerastium triviale*, *Potentilla Anserina*, and *Carex* sp. The grasses comprised:—

<i>Lolium perenne</i>	52	<i>Cynosurus cristatus</i>	1
<i>Dactylis glomerata</i>	24	<i>Holcus lanatus</i>	1
<i>Phleum pratense</i>	13	Undetermined	1
<i>Agrostis stolonifera</i>	8		

No. 76.—A turf sent by Mr. Thomas Barton, Dunsany Castle, Drumree, Co. Meath, Land Steward to Lord Dunsany. It is described as from one of the best fattening pastures on the estate.

The turf was nine inches deep, and exhibited no trace of roots on its lower face. The soil was a three-inch depth of clay, resting upon six inches of brown loam, moderately friable and stony. The growth was of a rich, grassy character, and, cut on July 19, it yielded:—

Gramineous herbage, 99 | Leguminous, 1 | Miscellaneous, a trace.

The leguminous herbage was exclusively *Trifolium repens*, and the miscellaneous herbage was *Cerastium triviale*. The grasses were:—

<i>Agrostis</i> sp.	37	<i>Alopecurus pratensis</i>	1
<i>Lolium perenne</i>	26	<i>Anthoxanthum odoratum</i>	1
<i>Holcus lanatus</i>	23	<i>Poa pratensis</i>	1
<i>Dactylis glomerata</i>	6	Undetermined	5

No. 77.—A turf from the "poisoned land of Meath," also sent, on behalf of the Hon. H. C. Plunkett, by Mr. Thomas Barton, who writes (Feb. 1889):—

"I have sent you a sod 12 in. $\times$ 12 in. $\times$ 12 in., taken from what is known as the poisoned land of Dunsany, thus called from the way it affects horses or horned stock when fed alone upon it. You will perceive the white marl at the bottom of the sod. This marl is found in this position whenever the cattle have been affected. Horses confined to graze upon this land will lose their hoofs, and all hair will fall from their manes and tails. Horned stock will lose their hoofs, and become unthrifty—in fact, will suffer severely from what is termed here a dry murrain. It also affects barndoor and wild fowl, as birds from their eggs are mostly deformed when hatched. I have had six horses idle for six months through losing their hoofs, caused by eating after-grass on this land during the months of August and September. This bad land—about 50 Irish acres—now forms part of a division of 120 Irish acres. The 70 acres added is very good land, and allows the fifty to be more profitably grazed than heretofore. It throws up an abundance of coarse herbage, which is not consumed until we have had some frost upon it. During the summer months it is quite remarkable to see the good land closely grazed, and the remainder like a meadow. This land, under tillage, grows enormous crops of roots—mangel, carrots, and turnips; the two former are consumed by cattle without any ill effects, but the turnips produce costiveness, as also does the hay grown upon it. Fifteen years ago, before these two divisions were joined together, it was impossible to keep the stock in health if they were kept for over a month on the affected parts—their noise, and position along the fences, wanting to get forth, were a warning to the herd. We are enclosing a portion of it this year to make ensilage of, which, I fear, will not be first class, as the herbage is very coarse."

The depth of this specimen was thirteen inches. The upper eight inches consisted of a dark brown, friable loam, somewhat peaty, resting upon two inches of quite black loam; and this upon three inches of whitish, or putty-coloured marl, slightly shelly.

The colour of the herbage was strikingly bluish-green, known to botanists by the term glaucous. It was, moreover, seen from the outset to consist very largely of *Dactylis glomerata*, and this would account for the coarse herbage to which Mr. Barton refers in his letter. The turf was mown on July 25, and gave:—

Gramineous herbage, 97 | Leguminous, 2 | Miscellaneous, 1.

Trifolium repens was the leguminous species, and the miscellaneous herbage was made up of *Cerastium* and *Potentilla*. The grasses were:—

<i>Dactylis glomerata</i>	68	<i>Agrostis stolonifera</i>	3
<i>Festuca ovina</i> et var.	13	<i>Cynosurus cristatus</i> }	traces
<i>Holcus lanatus</i>	10	<i>Poa</i> sp.	
<i>Festuca pratensis</i>	4	Undetermined	2

No. 78.—A turf from the famous Curragh of Kildare. It was dug nine inches deep, and showed no traces of root-fibres on the lower face. The soil was a reddish-brown, friable, sandy loam. From the commencement, and throughout its growth, the turf presented the characteristic features of Down herbage. It was not mown till August 20, and the herbage was so exceedingly close that it was difficult to cut it. The proximate analysis gave:—

Gramineous herbage, 40 | Leguminous, 1 | Miscellaneous, 59.

The small percentage of leguminous herbage was made up of *Trifolium repens* and *Lotus corniculatus*, with a trace of *Trifolium minus*.

Of the miscellaneous herbage, upwards of 98 per cent. was *Achillea Millefolium*, a familiar plant upon Downs. The remainder was made up of *Cerastium triviale*, *Luzula campestris*, *Prunella vulgaris*, *Bellis perennis*, *Cardamine pratensis*, and *Potentilla* sp. The grasses yielded the following percentages:—

<i>Festuca ovina</i> et var.	66	<i>Anthoxanthum odoratum</i> . . .	3
<i>Agrostis vulgaris</i>	19	<i>Avena flavescens</i>	2
<i>Cynosurus cristatus</i>	8	Undetermined	2

PARK AND MEADOW.

No. 79.—The extensive preparations which were being made early in 1889 for the Show of the Royal Agricultural Society, in Windsor Great Park, suggested a rare opportunity for the examination of the turf of that ancient grass-land. I accordingly made application to Sir Nigel Kingscote, at the Office of Woods, and he kindly placed me in communication with Mr. Simmonds, the Deputy-Surveyor of Windsor Parks and Woods, by whom the turf was sent. The specimen was six inches deep; the soil was a dirty, yellowish-brown, ferruginous clay, and no root-fibres were to be seen on the lower face. The turf, mown on July 27, yielded:—

Gramineous herbage, 99 | Leguminous, 1 | Miscellaneous, a trace.

The herbage was thus of an excessively grassy nature, the only plants detected besides grasses being *Trifolium repens*, *Trifolium pratense*, and *Ranunculus* sp. The separation of the grasses gave the subjoined result:—

<i>Agrostis</i> sp.	56	<i>Cynosurus cristatus</i>	1
<i>Lolium perenne</i>	18	<i>Alopecurus pratensis</i> }	1
<i>Festuca ovina</i> et var.	17	<i>Poa</i> sp. }	1
<i>Phleum pratense</i>	4	Undetermined	5

Much of the *Agrostis* was *A. stolonifera*, but *A. vulgaris* was also present.

No. 80.—A turf sent by Mr. R. Stratton, The Duffryn, Newport, Mon., from a field that has been mown every year for at least forty years. This meadow-land adjoins the old pasture-land from which turf No. 33 was taken. The specimen was nine inches deep, and the soil was a dark red, sticky loam, with no trace of rootlets on the lower face. From the outset the herbage was seen to be very weedy, and, cut on July 6, it yielded:—

Gramineous herbage, 49 | Leguminous, 1 | Miscellaneous, 50.

Trifolium repens and *Trifolium pratense* were the leguminous species present. The miscellaneous ingredients consisted mainly of *Rumex Acetosa* and *Achillea Millefolium*, the former rather preponderating. The remainder was made up of small quantities of *Cerastium triviale*, *Bellis*, and *Ranunculus*. The grasses yielded the following constituents:—

<i>Holcus lanatus</i>	25	<i>Cynosurus cristatus</i>	2
<i>Lolium perenne</i>	22	<i>Poa trivialis</i>	2
<i>Bromus mollis</i>	18	<i>Anthoxanthum odoratum</i> . . .	1
<i>Alopecurus pratensis</i>	17	Undetermined	4
<i>Agrostis</i> sp.	9		

The Durham turf (No. 52) is also, after ten years' continuous mowing, a true meadow turf.

V. TABLE SHOWING THE PERCENTAGE BY WEIGHT OF GREEN HERBAGE (GRAMINEOUS, LEGUMINOUS, AND MISCELLANEOUS) UPON EACH TURF FROM WALES, SCOTLAND, AND IRELAND.

[illegible]

VI. TABLE SHOWING THE PERCENTAGES BY WEIGHT OF SPECIES IN THE GRAMINEOUS HERBAGE OF EACH TURF FROM WALES, SCOTLAND, AND IRELAND.

	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
<i>Agrostis</i> sp.	6	—	21	32	22	13	28	75	29	33	37	24	28	—	74	23	50	33	39	19	8	37	—	19
<i>Lolium panicum</i>	85	23	50	24	27	66	24	5	—	—	29	26	—	61	6	27	7	7	24	61	52	26	—	8
<i>Cynocorus cristatus</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Holcus laevis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Poa</i> sp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Alopecurus pratensis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Festuca ovina</i> et var.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Dactylis glomerata</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Festuca pratensis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Poa pratensis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Others	4	7	1	2	8	8	1	—	4	6	1	6	7	2	8	3	—	3	5	3	2	3	7	5
Undetermined	5	8	2	7	2	7	5	10	3	6	11	7	7	6	9	7	6	10	4	9	1	6	2	2
Total	169	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	130	100	100	100	100	100	100	100

It will now be convenient to tabulate the results which have been detailed. Table I. (page 386), showing the distribution of species, presents a summary of the results obtained from the 31 English turfs. In it are named all the gramineous species, all the leguminous species, but only 7 of the most prominent miscellaneous species which were identified. Nineteen species of grasses are enumerated; but if *Agrostis* sp. be regarded as denoting 2 species, and *Festuca ovina* et var. as denoting 3 species, the number is brought up to 22. This Table is strictly qualitative, and only indicates the distribution of the species; it is silent as to the amount or quantity of the various species named, and it would be erroneous to draw from it any conclusions as to this latter point. As a census of species, Table I. is useful in that it records the relative frequency of occurrence in different localities of each species named. Thus, *Agrostis* sp. was found on every turf, *Lolium perenne* on all but one, and so on. The greatest number of species of grasses identified upon any one plot was 11, on one of the shallow Shropshire turfs (No. 44); the least number was 5, on the two excellent turfs from Cumberland (No. 26) and Monmouthshire (No. 33). The totals are not given in the Table of the miscellaneous species, because these are not all tabulated. As many as 17 miscellaneous species were recorded altogether, but, with the exception of the 7 given in the Table, none of them occurred on more than three turfs, and some on only one.

The quantitative results from the English specimens are presented collectively in Table II. (page 387), which records the percentages by weight of the three sections of green herbage. Table III., on the same page, indicates the percentage by weight of the total grass represented by each gramineous species, only those species which formed 5 per cent. or more of the total grass being separately recorded. This Table is of high significance, for it shows that *Lolium perenne* formed the largest proportion of the gramineous herbage in no less than 20 out of the 31 turfs, whilst *Agrostis* sp. was first in 4 cases, *Holcus lanatus* in 4, *Alopecurus pratensis* in 2, and *Dactylis glomerata* in 1.

Tables IV., V., and VI. (pages 388, 389) set forth the same kind of information for the Welsh, Scotch, and Irish turfs as the first three Tables furnish in the case of the English turfs. Table VI. indicates that, in the 6 specimens from Wales, *Lolium perenne*, which was present in all, was the most abundant grass in 4 cases, *Agrostis* sp. in 1, and *Festuca ovina* et var. in 1. No species of grass appears to have shown itself in significant quantity (over 5 per cent.) in all the 12 Scotch turfs, though *Agrostis* sp. made more than 5 per cent. in 11 of them, and *Lolium*

perenne and *Holcus lanatus* each in 7. Of the grasses, *Agrostis* sp. was most abundant in 3 cases, *Lolium perenne* in 3, *Holcus lanatus* in 3, and *Alopecurus pratensis*, *Poa* sp. and *Festuca ovina* et var., each in 1. The Scotch turfs differ in several interesting points from those of other parts of the British Isles.

Though it was desired to restrict this investigation to the herbage of pastures, yet in several cases turfs from meadows were sent—usually inadvertently. It seems desirable to distinguish between *pasture*, or grazing land, and *meadow*, or hayfield. That land which is more or less frequently mown differs in the relative composition of its herbage from land which is continuously grazed must be apparent from the results afforded by the turfs numbered 47, 52, 53, 54, 58, 59, 77, 80. A comparison of the pasture-turf, No. 83, with the adjoining meadow-turf, No. 80—both sent by Mr. R. Stratton—is particularly instructive. It will be noticed that, in the mown meadows, the tendency is for *Dactylis* or *Holcus* to become predominant, and for *Lolium* to recede. Here, then, is a striking confirmation of an observation recorded at the beginning of 1889, by Sir John Lawes, with reference to pastures he had laid down at Rothamsted since 1872:—"Some of the new grass has never been mown, but some has been mown occasionally. Wherever it has been mown, the amount of rye-grass has much diminished; but where it has never been mown, but only fed by cattle having cotton-cake, rye-grass is abundant." Although an important and useful grass in the hayfield—notably in temporary seed-layers—it is in the pasture, under the continuous treading and grazing of cattle, that rye-grass is more especially qualified to luxuriate.

It is but fair to myself to state that this investigation was entered upon without any reference to, or even any thought of, what is known as the Rye-grass Controversy. It originated, in fact, in a conversation, some years ago, between the President of the Surveyors' Institution (Mr. E. P. Squarey) and myself, as to what might be the exact character of the herbage of pastures. In my former paper I came to the conclusion that *Lolium perenne* was by far the most abundant grass, and *Trifolium repens* the most abundant clover, in old pastures. Last year—that is, in another season, and by quite a different method—Mr. Carruthers examined a select number of the pastures from which my specimens of 1888 were drawn, and his results appear in an earlier part (pp. 95–110) of the present volume.

I find, on looking into these results, that, of the 14 pastures Mr. Carruthers examined, rye-grass is recorded in 13, and no

other grass in so many. Further, that, on the average, it made up 21 per cent., or more than one-fifth, of the total herbage, whilst it made 50 per cent. more herbage than the species of grass next to it in average abundance. So with white clover: the figures of Mr. Carruthers show that it occurred in more of the pastures than all the other leguminous species recorded, and formed considerably more than twice as much herbage as the other leguminous species collectively. Such a result, obtained by methods so different from my own, is an interesting corroboration of the conclusions which I arrived at in 1888, and confirmed in 1889. Another noteworthy similarity is afforded by the case of *Festuca pratensis*. I found this species, as my Tables show, infrequent in occurrence and insignificant in quantity. In 14 pastures, Mr. Carruthers only found it twice, and then but to the extent of $\frac{1}{2}$ per cent. each time.

That my actual percentages of rye-grass are generally higher than those of Mr. Carruthers I attribute to the circumstance that, by close-cropping the turf with sheep-shears, I secured the rich undergrowth which is so characteristic of the free-tillering *Lolium perenne*. For the same reason I got a higher proportion of the close-lying *Trifolium repens*. I have calculated out for the whole series of 80 turfs which I examined the percentage of *Lolium perenne* in the total herbage, and I find that the 48 English turfs yielded an average of 42 per cent. of rye-grass, 6 Welsh turfs gave an average of 35 per cent., 14 Irish turfs 24 per cent., and 12 Scotch turfs 11 per cent.

In closing the record of this investigation, there remains to me the pleasant duty of expressing my thanks to the gentlemen who have sent me specimens of their pastures, and who have so obligingly answered the many inquiries with which I have found it necessary to trouble them.

W. FREEM.

Official Reports.

REPORT OF THE COUNCIL.

*To the Anniversary General Meeting of Governors and Members,
held at 12 Hanover Square, on Thursday, May 22, 1890.*

IN meeting the general body of Governors and Members for the first time during the second half-century of the Society's corporate existence, the Council are happy in being able to report the continued prosperity of the Society, and the sustained activity of all branches of its work.

2. The subjoined tabular statement shows the number of Governors and Members reported at the first Anniversary Meeting held on May 22, 1840, and at intervals of ten years since:—

Date	Governors		Members			Total
	Life	Annual	Life	Annual	Honorary	
1840	86	189	146	2,434	5	2,860
1850	90	169	627	4,356	19	5,261
1860	72	119	927	4,047	18	5,183
1870	74	74	1,511	3,764	15	5,438
1880	83	70	2,673	5,083	20	7,929
1890	122	58	3,846	6,941	17	10,984

3. During the year 7 new Governors and 840 Members have joined the Society, and 20 Members have qualified as Governors, whilst the deaths of 5 Life Governors, 138 Life Members, and 160 Annual Members have been reported. A total of 102 Members have been struck off the books under Bye-Law 10, owing to absence of addresses, 200 under Bye-Law 11, for arrears of subscriptions, and 279 have resigned.

4. As the Society completed its fiftieth year of life as a chartered body on March 26 last, the Council resolved at their meeting held in that month to elect as Foundation Life Governors of the Society all the surviving subscribers to the original English Agricultural Society who were on its books when the Charter was granted, and who have been connected with the Royal Agricultural Society ever since.

The Council have also given instructions for the preparation of an Alphabetical List of Governors and Members as on March 26, accompanied by a List of the Presidents, Trustees, Vice-Presidents, and Members of Council during the last fifty years. A copy of this List will be forwarded on application, when ready, to any Member of the Society.

5. The Council have elected the Rt. Hon. Sir James Caird, K.C.B., as an Honorary Member of the Society, in recognition of his long and distinguished services to agriculture.

6. These and other changes bring the total number of Governors and Members now on the Register to 10,984, divided as follows:—

122 Life Governors,
58 Annual Governors,
3,846 Life Members,
6,941 Annual Members,
17 Honorary Members ;

or a net increase of 118 Members during the year.

7. In last year's Report reference was made to a contemplated change in the amount of the life composition for Members in lieu of the annual subscription, and it has since been decided that Members elected after the end of 1889 shall be entitled to compound for all future subscriptions by a single payment of 15*l.*, to be reduced to 10*l.* after the payment of ten, and to 5*l.* after the payment of twenty, annual subscriptions of 1*l.* The privileges of Members elected before the end of 1889 are not affected by this arrangement, but remain as before.

8. The death of Mr. Herbert J. Little, on January 30 last, has deprived the Society of a distinguished Member, and the Council of a valued and esteemed colleague. For eight years Mr. Little's services as a Member of Council were actively in request, and his untimely decease is deeply regretted by his fellow-workers. To fill the vacancy on the Council caused by Mr. Little's death, Mr. Joseph P. Terry, of Berry Field, Aylesbury, has been elected. There are two other vacancies to be filled up by the General Meeting, one caused by the election of the Rt. Hon. Henry Chaplin, M.P., as a Vice-President, and the other caused by the retirement of a Member of Council under Bye-Law 23 (b).

9. The accounts for the year 1889 have been examined and certified by the Auditors and Accountants of the Society, and are published in the first number of the new Quarterly Journal. The final results of the working of the year show a credit balance of 2,047*l.* 19*s.* 8*d.*, and, after allowing for depreciation, the assets show a net increase of 1,281*l.* 7*s.* 0*d.* The balance at the Bankers' on the 1st instant was 7,279*l.* 5*s.* 2*d.*

10. The Council have made a further contribution of 50% towards the funds of the Mansion House United Association on Railway Rates, for the purpose of safeguarding the interests of agriculturists in the Board of Trade inquiry now proceeding.

11. The general arrangements for the forthcoming Meeting at Plymouth are well advanced. The Implement Yard and the Dairy will be open to Members of the Society and the public on Saturday, June 21, when the charge for admission to non-members will be 2s. 6d. The judging will take place in all the classes on Monday, June 23, when the charge for admission will be 5s. On Tuesday the charge for admission will be 2s. 6d.; and on the last three days, Wednesday, Thursday, and Friday, it will be 1s.

12. The total amount of space allotted in the Implement Department is 9,078 feet run, exclusive of open ground space, as compared with 10,743 feet at Nottingham in 1888, and 8,217 feet at Newcastle in 1887. The total entries of live-stock (horses, cattle, sheep, and pigs) are 1,779, as compared with 1,875 at Nottingham and 1,833 at Newcastle. There are 341 entries of horses, 641 of cattle, 576 of sheep, 221 of pigs, and 692 of poultry, besides 56 of cheese and 183 of butter.

13. Eighteen candidates have entered for the competitions of Butter-makers for the Society's Prizes and Certificates, to take place in the Showyard on Tuesday the 24th and Wednesday the 25th June. Thirty shoeing-smiths practising in the Society's District D will compete for the Prizes offered for Shoeing Hunters and Agricultural Horses on the Tuesday, Wednesday, Thursday, and Friday of the Meeting. On the Wednesday afternoon there will also be a Demonstration of Systems of Horse-shoeing not in common use.

14. At the Show of Horses which was held at the Royal Agricultural Hall last March, under the auspices of the Royal Commission on Horse Breeding, of the Hunters' Improvement and Hackney Horse Societies, and of this Society, the three Premiums and Gold Medals offered by the Society for Thoroughbred Stallions serving mares in District D during the forthcoming season, were awarded by the Judges to—

Mr. G. P. Finch's *Eclipse*.

Mr. Isaac Clark's *Jack Tar*

Mr. Alex. Taylor's *Lancastrian*.

These stallions are located for the season as follows :—*Eclipse* in the Exeter District, at his owner's stables, The Briars, Alphington, Exeter; *Jack Tar* in the Plymouth District; and *Lancastrian* in the Windsor District, at South Lea Farm, Datchet, near Windsor. Satisfactory reports have been received from the Local Committees as to the manner in which the nominations of mares to these stallions have been taken up.

15. The authorities of Leeds, having found it impossible to provide a suitable site, were reluctantly compelled to withdraw their invitation to the Society to hold its Country Meeting of 1891 at that town. A cordial invitation from the authorities at Doncaster having been received, and the Inspection Committee having reported favourably upon the site and accommodation offered, the Council have resolved that the Country Meeting of 1891 shall be held there. A portion of the famous Doncaster race-course will be set apart by the Corporation for the purposes of the Show. This circumstance, and the exceptional facilities of access by rail, combine to raise the highest expectations of the success of what will be the Society's first visit to Doncaster.

16. The Council have decided to offer, in connection with the Doncaster Meeting, three Prizes of 100*l.*, 50*l.*, and 25*l.* respectively, for the best combined Portable Threshing and Finishing Machine, to be worked by steam, and adapted to the preparation of corn for market. The regulations for this competition, which will be held before the opening of the Show, have already been issued, and the entries will close on Friday, August 1 next, in order that due arrangements may be made for the supply of the necessary corn for the trials.

17. In accordance with the usual rotation of Districts, the Country Meeting of 1892 will be held in District F, which consists of the counties of Gloucester, Hereford, Monmouth, Salop, Stafford, Warwick, Worcester, and of South Wales. An invitation to the Society to visit Warwick in that year has already been received, and will be considered, with any other invitations from towns in the District, after the autumn recess this year.

18. The Council have appointed as Provincial Veterinary Surgeons of the Society, Mr. ROBERT ROBERTS, of Wrexham, for Flintshire; Professor W. T. WILSON, of Cirencester, for Gloucestershire; and Mr. A. W. MASON, of Leeds, for the West Riding of Yorkshire (additional).

19. The Examiners on the diseases of animals of the farm other than the horse, in the examinations for the diploma of the Royal College of Veterinary Surgeons held last year, have reported that the following gentlemen attained the greatest distinction:—

Mr. H. H. MILWARD, Mareham-le-Fen, Lincolnshire.
Mr. J. GOLLEDGE, Whaddon Grove, Trowbridge.

The Society's Silver Medal has, therefore, been awarded to Mr. Milward, and the Bronze Medal to Mr. Golledge.

20. At the last General Meeting it was reported that the Council had expressed to the Worshipful Company of Farriers their willingness to co-operate with it in its efforts to promote skilled Farriery

and the examination and registration of duly-qualified Shoeing-smiths. Subsequently a Conference was held of representatives of the Worshipful Company, of the Royal College of Veterinary Surgeons, and of this Society ; and a comprehensive scheme, settled by the Conference, has now been approved by each of the three bodies represented. A public meeting at the Mansion House has been convened by the Farriers' Company for Monday, June 2 next, in support of the objects of the scheme ; and the Council have resolved to make an annual grant of 50% for the next three years towards the expenses of starting the system of registration, and of putting the new organisation upon a sound financial basis.

21. Investigations have been carried on during the last six months in reference to the conditions under which tuberculosis is communicated from one class of animals to another, and from man to the lower animals ; also in regard to the micro-organisms of pleuro-pneumonia, and the effects of inoculation. The action of the various organisms found in swine which have died of swine-fever has been tested by experiments in feeding and inoculation, but no organism has yet been isolated which is capable of inducing typical swine-fever or pleuro-pneumonia. These investigations will be continued.

22. The arrangements for the establishment of a Department of Scientific Research at the Royal Veterinary College under a grant from the Society are proceeding, and it is expected that the Department will shortly be in full work. Mr. P. D. Coghill, of the Laboratory of the Royal College of Physicians, Edinburgh, has been appointed Superintendent of the Bacteriological Laboratory, and Curator of the Museum, by the Governors of the Royal Veterinary College.

23. The Council are gratified to report that their persistent efforts, in concert with other Agricultural bodies, for placing the slaughter of animals affected with pleuro-pneumonia under Government control, and for the payment of compensation at the cost of the Imperial Exchequer, have been so far successful that a Bill with these objects has been introduced, on behalf of the Government, by the President of the Board of Agriculture, and has already passed through some of its stages. The Council trust that by the firm enforcement of this Act, when passed, the ruinous disease of pleuro-pneumonia will be speedily stamped out of the country.

24. The Council have observed with alarm the renewal of proposals for the admission into this country of cattle from the United States without being subject to slaughter ; and, in view of the serious risk which would thus be incurred of introducing disease, they have entered, in a resolution unanimously passed, at their meeting on April 2, and forwarded to the Board of Agriculture, an emphatic protest against any present relaxation of the existing regulations.

25. In their last Quarterly Report to the Council, the Chemical Committee again drew attention to the number of cases that had recently come under their notice of impure linseed-cakes branded and invoiced "95 per cent.," the word "pure" being omitted; and also to the prevalent disregard by Members of the recommendation of the Society, printed in the Appendix to each number of the Journal, that all feeding-cakes should be guaranteed pure, and be delivered in good condition. The Council have therefore prepared Forms of Contract Note and Invoice embodying these conditions, which have been freely distributed amongst Members of the Society, and further copies of which may at all times be had on application to the Secretary.

26. From December to the end of April over 750 samples have been sent by Members and analysed in the Chemical Laboratory. In addition, over 60 samples of manures and feeding-stuffs have been analysed in connection with the Woburn Experimental Farm, and the experiments of Local Agricultural Societies. Manures such as Superphosphate, Nitrate of Soda, Sulphate of Ammonia, and other manures sold under a definite guarantee, have, with few exceptions, proved equal to the guaranteed quality. Several samples, however, of manures sold without any guarantee, and in some cases at extravagant prices, have proved to be either practically worthless, or of very little value.

27. The Feeding Experiments on Bullocks and Sheep carried on during the past winter at the Woburn Experimental Farm have just been concluded. One hundred sheep and 16 bullocks have been fattened; the respective increases in live weights have been periodically recorded, and the final fatted and carcass weights carefully ascertained.

28. Notwithstanding the considerable reduction in the fees to Members for the examination of Plants and Seeds, announced in last year's Report, there has been a decrease in the applications to the Consulting Botanist during the course of the present year, the number having fallen from 311 in 1889 to 260 in 1890. The quality of the seeds continues to be, on the whole, satisfactory, though occasionally very bad samples are submitted, as in the case of a parcel of perennial rye-grass, two-thirds of which consisted of soft brome-grass. Many samples of cocksfoot have contained considerable quantities of Yorkshire fog. Seventeen per cent. of the samples of alsike clover, and 6 per cent. of red clover, have contained seeds of dodder. In several instances the samples sent have not been large enough to form a satisfactory judgment of the bulk.

29. The applications to the Consulting Entomologist respecting the nature and methods of prevention of insect-pests continue to be very numerous, and inquiries as to warble prevention continue steadily. Much communication has been taking place for several

weeks regarding the best methods of avoiding a repetition of the caterpillar blight, which has now for some years ravaged in the early summer the orchards in the chief fruit-growing counties. The careful experiments now being tried give hope of satisfactory advance. The Consulting Entomologist has been in active correspondence with inquirers and fellow-workers as to the methods by which serviceable information on Agricultural Entomology could be best conveyed for direct farm use in agricultural districts, as well as for practical and scientific instruction to agricultural students.

30. Sixteen candidates competed at the Society's Senior Examinations which took place from the 13th to the 17th of this month, as compared with 24 candidates last year and 13 in 1888. Owing to the date of the Examination having been unavoidably fixed a little later than usual, it will not be possible to announce the results before the Meeting of Council to be held in June. (See page 42).

By Order of the Council,
 ERNEST CLARKE,
 Secretary.

REPORT ON THE BULLOCK-FEEDING EXPERIMENTS AT CRAWLEY MILL FARM, WOBURN, DURING THE WINTER OF 1889-90.

THESE experiments were arranged for the purpose of ascertaining to what extent cake would replace hay in the feeding of bullocks, and how the final results compared.

Sixteen three-year-old Shorthorn bullocks were placed under experiment and divided into three lots.

Lot 1. Six bullocks received daily per head :

	lb.
Decorticated cotton-cake	3
Linseed-cake	3
Swedes and hay	<i>ad lib.</i> (but weighed)

Lot 2. Six bullocks :

Decorticated cotton-cake	1½
Linseed-cake	1½
Swedes and hay	<i>ad lib.</i> (but weighed)

Lot 3. Four bullocks.

Swedes and hay only	<i>ad lib.</i> (but weighed)
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Four beasts of lots 1 and 2 were kept in the feeding boxes, and two of each lot in the open yard. The four beasts in lot 3 were kept tied up in a covered shed.

The roots and hay and water were weighed out every morning, and any unconsumed food was weighed back and deducted from the

amount taken. The quantity of cake given to the bullocks was gradually increased till the maximum of 10 lb. and 5 lb. per head in lots 1 and 2 respectively was reached. The bullocks were fed first at seven in the morning, when they were given roots and hay, and half their allowance of cake. At 11.30 A.M. more roots and hay were given, and at 4 o'clock in the afternoon the remainder of the cake was given.

The experiment was commenced on December 30; the weights will be found on Table I. The beasts were weighed again on February 8, after the first period of forty days.

All the animals, with the exception of No. 12 in lot 3, kept in good health. No. 12 unfortunately had a slight cold at the commencement of the experiment, and this developed into inflammation of the lungs, and the beast had to be taken out of the experiment.

TABLE I.—*First Period of 40 Days—Dec. 30, 1889, to Feb. 8, 1890.*

Lot 1.

No.	Weight on Dec. 30			Weight on Feb. 8			Gain during 40 days			Gain per day
	cwt.	qrs.	lb.	cwt.	qrs.	lb.	cwt.	qrs.	lb.	lb.
In boxes {	1	10	0 7	11	1 4		1	0 25		3.42
	2	10	3 0	12	1 18		1	2 18		4.65
	3	9	1 11	10	2 0		1	0 17		3.22
	4	10	3 0	12	1 24		1	2 24		4.80
In yard {	15	9	2 0	10	2 0		1	0 0		2.80
	16	9	3 0	11	1 7		1	2 7		4.37
Total .	60	0 18		68	1 25		8	1 7		

Average gain per head per day of Lot 1: 3.37 lb.

Lot 2.

In boxes {	5	10	2	22	12	0	6	1	1	12	3.80
	6	9	0	24	10	2	10	1	1	14	3.85
	7	10	3	25	11	3	8	0	3	11	2.87
	8	10	0	0	11	1	15	1	1	15	3.87
	13	10	0	21	11	0	14	0	3	21	2.62
In yard {	14	9	0	16	10	0	8	0	3	20	2.60
Total	60	0	24	67	0	5	6	3	9		

Average gain per head per day of Lot 2: 3.18 lb.

Lot 3.

9	10	0	11	10	1	21	0	1	10	.95
10	10	1	25	11	0	11	0	2	14	1.75
11	9	0	18	9	3	9	0	2	19	1.85
Total	29	2	26	31	1	13	1	2	15	

Average gain per head per day of Lot 3: 1.62 lb.

Return of Foods consumed during First Period of 40 Days.

	Lot 1 (6 beasts)		Lot 2 (6 beasts)		Lot 3 (3 beasts)	
	Total weight consumed during 40 days	Average per head daily	Total weight consumed during 40 days	Average per head daily	Total weight consumed during 40 days	Average per head daily
Swedes	cwt. qrs. lb. 86 3 4	lb. 40·50	cwt. qrs. lb. 92 0 16	lb. 43·00	cwt. qrs. lb. 49 0 0	lb. 45·73
Hay	26 2 18	12·44	30 2 22	14·82	17 1 0	16·10
Linseed cake and decorticated cotton cake	15 3 12	7·40	7 3 20	3·70	—	—
Water	115 3 0	54·01	103 2 0	48·30	33 2 14	31·38

The bullocks were weighed again on March 21; their weights and the quantity of food consumed are shown in Table II.

TABLE II.—Second Period of 41 Days—Feb. 8 to March 21.

Lot 1.

No.	Weight on Feb. 8, 1890	Weight on March 21, 1890	Gain during 41 days	Gain per day
	cwt. qrs. lb.	cwt. qrs. lb.	cwt. qrs. lb.	lb.
In yard in boxes { 1 2 3 4 15 16	11 1 4	11 3 25	0 2 21	1·87
	12 1 18	13 2 4	1 0 14	3·07
	10 2 0	11 2 16	1 0 16	3·12
	12 1 24	13 1 15	0 3 19	2·51
	10 2 0	12 0 0	1 2 0	4·09
	11 1 7	12 2 16	1 1 9	3·63
Total .	68 1 25	75 0 20	6 2 23	—

Average gain per head daily of Lot 1: 3·05 lbs.

Lot 2.

	12 0 6	12 3 17	0 3 11	2·31
In yard in boxes { 5 6 7 8 13 14	10 2 10	11 1 25	0 3 15	2·41
	11 3 8	12 2 1	0 2 21	1·87
	11 1 15	12 0 10	0 2 23	1·92
	11 0 14	12 0 21	1 0 7	2·90
	10 0 8	11 2 3	1 1 23	3·97
Total .	67 0 5	72 2 21	5 2 16	—

Average gain per head daily of Lot 2: 2·56 lb.

Lot 3.

9	10 1 21	11 1 19	0 3 26	2·68
10	11 0 11	11 3 17	0 3 6	2·19
11	9 3 9	10 1 17	0 1 26	1·31
Total .	31 1 13	33 2 15	2 1 2	—

Average gain per head daily of Lot 3: 2·06 lb.

Return of Foods consumed during Second Period of 41 Days.

	Lot 1 (6 beasts)		Lot 2 (6 beasts)		Lot 3 (6 beasts)	
	Total weight consumed during 41 days	Average per head daily	Total weight consumed during 41 days	Average per head daily	Total weight consumed during 41 days	Average per head daily
Swedes	cwt. qrs. lb. 87 3 12	lb. 40-00	cwt. qrs. lb. 98 3 10	lb. 45-00	cwt. qrs. lb. 54 3 18	lb. 50-00
Hay	31 0 19	14-19	34 2 9	15-74	18 3 24	17-26
Linseed cake and decorticated cotton cake	19 2 24	8-97	9 3 12	4-48	—	—
Water	130 3 0	59-52	117 2 0	53-49	37 1 0	33-91

At the commencement of the third period mangel was substituted for swedes, the latter having been all consumed.

Table III. gives the weights of the bullocks on April 19, the practical conclusion of the experiment.

TABLE. III.—*Third Period of 29 days, March 21 to April 19.*

Lot 1.

No.	Weight on March 21			Weight on April 19			Gain during 29 days			Gain per day
	cwt.	qrs.	lb.	cwt.	qrs.	lb.	cwt.	qrs.	lb.	lb.
In yard in boxes {	1	11	3 25	12	2 20	0	2 23			2-72
	2	13	2 4	14	0 2	0	1 26			1-86
	3	11	2 16	12	0 18	0	2 2			2-0
	4	13	1 15	14	0 2	0	2 15			2-45
	15	12	0 0	12	1 11	0	1 11			1-34
	16	12	2 16	13	1 14	0	2 26			2-83
Total .	75	0 20		78	2 11		3 1 19			

Average gain per head per day of Lot 1: 2-20 lb.

Lot 2.

In yard in boxes {	5	12	3 17	13	1 11	0	1 22			1-72
	6	11	1 25	11	3 4	0	1 7			1-21
	7	12	2 1	13	0 7	0	2 6			2-14
	8	12	0 10	12	2 24	0	2 14			2-41
	13	12	0 21	12	2 0	0	1 7			1-21
	14	11	2 3	11	3 7	0	1 4			1-10
Total .	72	2 21		75	0 25		2 2 4			

Average gain per head per day of Lot 2: 1-63 lb.

Lot 3.

9	11	1 19	11	1 18	loss 1	—
10	11	3 17	12	0 0	gain 11	38
11	10	1 7	10	1 8	" 1	—
Total .	33	2 15	33	2 26	0 0 11	

TABLE III. (cont.)—Return of Food consumed during Third Period, 29 days.

—	Lot 1 (6 bullocks)		Lot 2 (6 bullocks)		Lot 3 (3 bullocks)	
	Total weight consumed during 29 days	Average per head daily	Total weight consumed during 29 days	Average per head daily	Total weight consumed during 29 days	Average per head daily
Mangel . . .	cwt. qrs. lb. 62 0 16	lb. 40·0	cwt. qrs. lb. 69 3 18	lb. 45·0	cwt. qrs. lb. 38 3 10	lb. 50·0
Hay . . .	23 0 11	14·87	26 0 6	16 77	13 3 16	17·88
Linseed cake and decorticated cotton cake	15 2 4	10·0	7 3 2	5·0	—	—
Water . . .	104 3 0	67·42	95 3 0	61·63	41 0 0	52·78

TABLE IV.—Gain during whole Period of 110 days, Dec. 30 to April 19.

Lot 1.

No.	Weight on Dec. 30	Weight on April 19	Gain during 110 days	Average gain during 110 days
	cwt. qrs. lb.	cwt. qrs. lb.	cwt. qrs. lb.	cwt. qrs. lb.
In boxes { 1	10 0 7	12 2 20	2 2 13	} 3 0 8 or 3·12 lb. per day
2	10 3 0	14 0 2	3 1 2	
3	9 1 11	12 0 18	2 3 7	
4	10 3 0	14 0 2	3 1 2	
In yard { 15	9 2 0	12 1 11	2 3 11	
16	9 3 0	13 1 14	3 2 14	
Total .	60 0 18	78 2 11	18 1 21	

Lot 2.

	10 2 22	13 1 11	2 2 17	} cwt. qrs. lb. 2 2 0 or 2·54 lb. per day
In boxes { 6	9 0 24	11 3 4	2 2 8	
7	0 3 25	13 0 7	2 0 10	
8	10 0 0	12 2 24	2 2 24	
In yard { 13	10 0 21	12 2 0	2 1 7	
14	9 0 16	11 3 7	2 2 19	
Total .	60 0 24	75 0 25	15 0 1	

Lot 3.

9	10 0 11	11 1 18	1 1 7	} cwt. qrs. lb. 1 1 9 or 1·36 lb per day
10	10 1 25	12 0 0	1 2 3	
11	9 0 18	10 1 8	1 0 18	
Total .	29 2 26	33 2 26	4 0 0	

TABLE IV. (*cont.*)—*Food Consumed during whole Period of 110 days.
Dec. 30 to April 19.*

	Lot 1 (6 bullocks)		Lot 2 (6 bullocks)		Lot 3 (3 bullocks)	
	Total amount consumed during 110 days	Average per head daily	Total amount consumed during 110 days	Average per head daily	Total amount consumed during 110 days	Average per head daily
	tons cwt. qrs. lb.	lb.	tons cwt. qrs. lb.	lb.	tons cwt. qrs. lb.	lb.
Roots	11 16 3 4	40-18	13 0 3 16	44-27	7 2 3 0	48-44
Hay	4 0 3 20	13-73	4 11 1 9	15-49	2 10 0 22	17-03
Linseed cake and decorticated cotton cake	2 11 0 12	8-67	1 5 2 6	4-33	—	—
Water	17 11 1 0	59-66	15 16 3 0	53-75	5 11 3 14	37-96

Table IV. shows the total increase in live weight of the bullocks during the whole experiment. From this it is seen that the six bullocks in lot 1, which received the double quantity of cake, have made an average increase of 3-12 lb. per head per day, those in the yard doing quite as well as those fed in the boxes.

The bullocks in lot 2, which received only half the quantity of cake, show an average daily gain of 2-54 lb., and no practical difference is apparent in the increases of the box and yard-fed beasts.

The bullocks in lot 3 receiving roots and hay alone give an average daily gain of only 1-36 lb. During the last period these beasts appear to have remained practically stationary in weight. They were, however, throughout the experiment in excellent health and to all appearance were doing very fairly well. On calculating the cost of the foods given to each lot, the advantage of the cake-feeding becomes still more strikingly apparent. Thus, taking the cakes at the then current prices, linseed cake 9*l.* per ton, decorticated cotton cake 6*l.* 15*s.* per ton, and estimating the roots at 10*s.* per ton and the hay at 3*l.* per ton, the cost of the food of each lot is as follows.

	Lot 1.		Lot 2.		Lot 3.	
	£	s. d.	£	s. d.	£	s. d.
Roots	5	18 4	6	10 6	3	11 4
Hay	12	2 9	13	14 0	7	10 8
Linseed-cake	11	10 0	5	15 0	—	—
Decorticated cotton-cake	8	12 6	4	6 3	—	—
	38	3 7	30	5 9	11	2 0
	(6 bullocks)		(6 bullocks)		(3 bullocks)	
	cwt. qrs. lb.		cwt. qrs. lb.		cwt. qrs. lb.	
Total increase in live weight	18 1 21		15 0 1		4 0 0	
	= 2065 lb.		= 1681 lb.		= 448 lb.	
Cost per lb. of increase of live weight	4-43 <i>d.</i>		4-32 <i>d.</i>		5-94 <i>d.</i>	

In addition to the difference in the cost per lb. of increase in live weight in the hay-fed and the cake-fed bullocks, the increased value of the manure from the latter must also be taken into consideration.

Thus, taking the manurial values of the food consumed according to Lawes and Gilbert's tables, as—linseed-cake, 3*l.* 18*s.* 6*d.* per ton; decorticated cotton-cake, 5*l.* 13*s.*; hay, 1*l.* 8*s.* 7*d.*; and roots 4*s.* 8*d.* per ton, we arrive at the following results:—

	Lot 1.			Lot 2.			Lot 3.		
	£	s.	d.	£	s.	d.	£	s.	d.
Total cost of food	38	3	7	30	5	9	11	2	0
Less manurial value	20	15	5	15	13	7	5	5	1
	17 8 2			14 12 2			5 16 11		
Cost per lb. of increase in live weight	2·02 <i>d.</i>			2·09 <i>d.</i>			3·13 <i>d.</i>		

From these it would appear that the double quantity of cake had been economical. The percentage of carcass in the more highly-fed beasts was greater than in the others. Samples of the food were taken every week and the average composition is shown below.

Analysis of Foods consumed by Bullocks.

—	Decorticated cotton cake	Linseed cake	Hay	Swedes	Mangel
Moisture	9·86	12·22	13·45	88·83	86·82
Oil	13·58	11·26	—	—	—
Albuminous compounds	39·94	26·81	8·15	1·05	1·09
Mucilage, starch, digestible fibre, &c.	23·89	35·34	46·78	8·47	10·45
Woody fibre	6·33	8·69	25·59	·98	·77
Mineral matter	6·40	6·18	6·03	·67	·87
—	100·00	100·00	100·00	100·00	100·00
¹ Containing nitrogen	6·39	4·21	1·30	·17	·18

As originally arranged, the bullocks were to be fasted on the farm and slaughtered in the neighbourhood, it being thought that a better result would be obtainable by quietly fasting the beasts for a longer time on the farm than by exposing them to the knocking about of a railway journey.

At the last moment, however, the arrangements for slaughtering at Woburn fell through, and Mr. Elliott, the resident farm manager, had to arrange for the beasts to be slaughtered at Oxford. He was unable to arrange for the whole fifteen to be taken in one lot; only half the number could be dealt with at one time. Accordingly, three bullocks each, of lots 1 and 2, and two of lot 3, after being weighed were fasted at the farm, being kept in the boxes and yard without food for twenty-six hours. The fasted weights were then taken. No. 14 of lot 2, however, managed to get over the rails that divided him from the non-fasting bullocks in the yard, and consequently he was not properly fasted, and his carcass weight was too low.

The remaining seven beasts were fed with their regular allowances of food until April 26, when their weights were taken previous to fasting. The two bullocks, Nos. 13 and 15, which had hitherto been fed in the yard, went completely off their feed, no doubt on account of the loss of their companions. It was impossible to put them in the same pen, as they were receiving different quantities of cake; they were accordingly removed to the feeding boxes, but they went noticeably back in condition and lost weight. None of these beasts indeed seemed to have recovered from the disturbing effect of weighing.

This is a constant difficulty in the feeding experiments both of bullocks and sheep, and it is proposed to try the plan of purchasing younger bullocks, and, before commencing the feeding experiment, to get them thoroughly accustomed to being handled and weighed.

LIVE AND DEAD WEIGHTS OF BULLOCKS.

Lot 1.

Number	Unfasted weights		Fasted live weights		Carcase weight Stones of 8 lb.
	April 19, 1890	April 26, 1890	—	Stones of 14 lb.	
1	cwt. qrs. lb. 12 2 20	12 3 6	12 1 7	98 7	91 7
2	14 0 2	14 0 2	13 1 17	107 3	113 0
3	12 0 18	—	11 1 22	91 8	97 4
4	14 0 2	—	13 1 0	106 0	108 6
15	12 1 11	11 1 11	11 1 4	90 4	95 2
16	13 1 14	—	12 1 8	98 8	101 0
—	78 2 11	—	74 0 2	592 2	610 3 = 58·90 p.c.

Lot 2.

5	13 1 11	—	12 1 15	99 1	101 5
6	11 3 4	—	11 0 10	88 10	91 4
7	13 0 7	13 0 13	12 2 17	101 3	100 0
8	12 2 24	12 3 4	11 3 20	95 6	94 4
13	12 2 0	11 2 8	10 3 14	87 0	92 6
14	11 3 7	—	11 1 6	90 6	86 6
—	75 0 25	—	70 0 26	561 12	567 1 = 57·68 p.c.

Lot 3.

9	11 1 18	11 2 2	10 2 23	85 9	84 2
10	12 0 0	—	11 1 10	90 10	92 4
11	10 1 8	—	9 2 23	77 9	82 6
—	33 2 25	—	31 3 0	254 0	259 4 = 58·44 p.c.

It may be mentioned that the bullocks realised 4s. 7d. per stone, dead weight; no practical difference was observable in the appearances of the carcasses of the two cake-fed lots. In the carcasses of lot

3, it was noticed that the fat was rather firmer than that of the others. During the experiment the beasts were weighed at the end of each period with a full stomach. The weights of the carcasses were personally taken by Mr. Elliott.

The experiment of fasting the bullocks at the farm did not turn out satisfactorily; some of the beasts, owing to their eating their litter, were not thoroughly fasted, and thus their carcass weights came out very low. This was particularly noted in the case of bullock No. 1.

E. W. VOELCKER.

REPORTS OF CONSULTING ENTOMOLOGIST.

Infestation of Fruit Trees by Caterpillars.

DURING the late winter and spring months, much attention has been directed in the Western fruit-growing counties to ascertaining what reliable measures could be adopted in order to destroy the hordes of caterpillars which now appear almost as a regular, yearly recurring cause of serious loss to fruit-growers.

It has become more and more plain each year that although sticky banding is so far of service, that in many cases the foliage of orchard trees would have been totally destroyed if the banding had not been done, yet still that it is only a partial protection against wingless moths gaining access to the trees for egg-laying, and is no protection at all from the many kinds of attack originated by winged infestations: also it is expensive, needs renewing at intervals; and, without special arrangements to insure safety to bark, is detrimental to the health of the trees.

Measures were found to be absolutely necessary of a kind which could be brought to bear on any or all sorts of caterpillars together (whatever their various natures or previous histories may have been), and would kill the whole collection of ravaging hordes at once, but without damaging the leafage. It was before us all in reports of the Agricultural Departments and State entomologists of Canada and the United States, that for years back attacks to orchard trees, perfectly similar in their nature to those which have been causing us such loss here, were lessened or wholly prevented there by applications, and especially fluid applications, sprayed on to the trees, of which full details were given; and to meet our urgent need, it was arranged by a conference of leading fruit-growers, of which the headquarters are at Evesham, to form a committee of experiment to test the serviceableness of these applications in our rather different climate, and (at present) with our inferior apparatus for throwing fluids. This committee is working actively and with satisfactory results. I am in especial communication with Mr. J. Masters, of Evesham, the hon. secretary, and likewise with Captain

Corbett and Mr. C. D. Wise, respectively the superintendent and deputy superintendent of the Toddington fruit grounds. Mr. Fletcher, the Dominion entomologist of Canada, favours us with very serviceable advice from time to time, and I am doing all that lies in my power by co-operation, and also by identifying specimens sent me by the committee and neighbouring gentlemen, so that we might know with certainty what we were dealing with, and (approximately) the date of the first appearance of the caterpillars.

From examination of eggs sent me, known to have been laid last autumn (on isolated apple twigs) by female winter moths, I have been able to note and record the measurement and colour, and change of tint before hatching, of the winter moth egg, and from an enormous quantity of specimens, the result of the work of three men for three hours in trimming infested ends of apple twigs (sent me by Mr. C. Lee Campbell, of Glewstone Court, near Ross), I have also been able to note the manner in which the eggs are placed, and to see that although these dull reddish oval eggs, only about the $\frac{1}{3}$ of an inch in length, are hardly visible to the naked eye, yet before hatching time, when the caterpillar is taking its full colour, or afterwards when the iridescent transparent egg pellicles remain on the bark, then the whitish or greyish mould-like specks, where several eggs were near together on a bough, showed sufficiently to be of practical use in guiding to where caterpillars were establishing attack.

The date of first hatching or attack might be put this year at the end of March. At that time winter moth caterpillars were beginning work near Ross, although they were not then noticeable at Toddington, and I was myself able to note their appearance as they made their exit from the egg and entrance into life, 'looping' as dexterously and markedly as in their later days.

The March moth, another very injurious kind, was then laying its bands of eggs; and Mottled umber moth was also about.

In my own suggestions as to applications I limited myself to advising trials of 'Paris green' spray, as with this application we had clear information from the U.S.A. and Canadian Government reports of the exact proportions in which it was to be used, and of every detail concerned, and also of its success, and warnings as to requisite caution in use, it being a poison; for those who did not care to try it (by advice of the Dominion entomologist) I suggested the use of washes of soft soap and mineral oil.

The Experiment Committee has wisely made a trial and recorded results of many applications, and of these after the committee meeting at Toddington on the 1st of May last the committee decided that they would recommend the following for spraying on infested trees:—Paris green paste, in the proportion of one ounce to eight or ten gallons of water for plums, and one ounce to twenty gallons of water for apples; London fluid (that is, a mixture of a preparation sold as 'London purple') one part to twenty parts. Both of these the committee recommend as effective in destroying the caterpillar, while they did no material harm to the foliage.

It will be observed that the term Paris green 'paste' is used. In order to avoid risk to health from careless workers inhaling the powder, one of our chief supply firms arranged to send out small orders damped, which saves all danger from inhalation in mixing. Besides the above experiments, which are considered to be progressing satisfactorily, I have had information of the successful use of the Paris green, or arsenite of copper, from private correspondents, and am in much communication on the subject, and also (it being a new application here and a poison) I invariably warn that *it is not to be left about nor the powder inhaled*. At present the main point under consideration is, I believe, date of application. Mr. Masters added to the observations on the part of the committee that they considered the syringing should be done when the leaf bud was first developed, before the blossoming period, and then again after the blossoms had disappeared and the fruit was forming.

The work is considered to have progressed satisfactorily, and if, as there appears to me reason to hope, our operations succeed as well as they have long done in America, the hard and skilled work of the Evesham Committee will be a benefit throughout the country.

Mr. C. D. Wise, the Deputy-Superintendent at the Fruit Grounds at Toddington, writing on May 28, says:—

We have, as you know, tried all sorts of mixtures, and I don't think it is worth while troubling you with all particulars of them, as they were all useless or nearly so. Paris green is the only thing which we have found really efficacious. For plums the proportion is 1 oz. to 10 gallons, and for apples 1 oz. to 20 gallons. We have also used the former strength for currants, but as the foliage is within the last few days becoming so much stronger, we have been using it at 1 oz. to 8 gallons. Neither of these solutions has damaged the foliage, but killed the caterpillar.

The Paris green should certainly not be used any stronger than we have used it.

As regards the Riley nozzle, we have tried it and found it very similar to that on the French pumps; in fact, there is very little difference between the two, that is, in the way the liquid is distributed.

Owing to an attack of green fly on the plums we have lately been syringing them with 2 oz. of quassia and 2 oz. of soft soap to 1 gallon of water, with Paris green added in the proportion before named. The Paris green should certainly not be used any stronger than we have used it.

Mr. Masters, the secretary of the Evesham Experimental Committee, has reported, continuing his previous information as to the efficacy of the Paris green in destroying the caterpillar, and also confirmatory proof that the Paris green might be used with perfect safety to foliage at a greater strength than that mentioned above. He also noted that in some districts where the greasing precautions were resorted to, and where there was no fruit to encourage the grower to take any precautions, the trees were looking desolate—as bad as if fire had been scorching the trees.

I also requested information from Messrs. A. Salmon (Fruit Growers), near Hounslow, in order to obtain a report of the effects of the application on a regular scale of working business, with ordinary garden engines, and Messrs. Salmon reported in reply, on the

31st of May :—"All we can say about it is to its advantage. It has succeeded admirably. The trees look healthier and better, with as much (if not more) on, as anywhere else. They are beautifully clean. It has not injured them in the slightest degree. We shall always use it in case of blight."

Messrs. Salmon also noted—relatively to recent unfounded objections to the use of Paris green on the alleged ground that it killed the birds—that the writer of these knew nothing of the subject, for that they had not found one bird dead, nor signs of harm to one. A large number of reports have been sent me ever since the beginning of our work—and from very various localities ; but in not one of them have I had the slightest reference to injury occurring to birds from the use of Paris green, and I have also definite reports of injury not being found to occur where under careful special observation fowls were allowed access to the ground beneath the trees.

I have taken the above reports from different kinds of localities to show the success that the application is meeting with both in private and regular business use, and with our common engines as well as with the more elaborate methods of distribution.

For security, I always give the most careful warnings as to requisite care in use, *and not risking presence of sheep or other animals under sprayed trees*, and warnings are repeatedly published—but with regard to success and safety, with reasonable precaution, I do not think we can have more complete proof than the serviceable use of the green for from ten to eighteen years in Canada and the States, and the constantly increasing use of it there up to the present time.

I am giving all attention in my power to the inquiries as to these attacks, and carefully pointing out where, as with some of the infestations to bush fruits, such as gooseberries, raspberries, and currants, these can be satisfactorily met by measures based on their habits.

Attack to Strawberry Plants.

I am sorry, also, to have to report a very serious kind of attack to strawberry plants, which appears not to have been previously observed—a large quantity of plants, of which a box full were sent me for examination, have been ruined by it on a fourteen acre strawberry field.

The effect of the attack is swelled and distorted growth. The whole of the shoots are in some cases greatly swollen, sometimes the whole of the flower stems and buds are stunted, and so enormously swelled at the ends that they can be compared to nothing but a bit of mis-shapen cauliflower. In another form the primary and secondary flower stems, although they preserve something of their shape, are only about half or quarter of their right height, widened, and ~~curved~~ *curved* at the top with calyx enlarged and standing upright, ~~abortive petals~~ *abortive petals*, and still more abortive stamens.

At a glance the state of the plants pointed to eelworm attack, and on microscopic examination I found great numbers in most

active health present. I noted the general characteristics of these, and forwarded specimens to Dr. Ritzema Bos, as the most skilled referee on this kind of attack, and he will be good enough to investigate the matter fully as soon as his time permits. At present the disease appears to him, as well as to myself, to be undescribed, and though many eelworms are present, there is a possibility that the disease may be fungoid.

Meanwhile, I am cautioning the fruit-grower on the necessity of great care in not allowing the infestation to spread, especially as to burning any plants that are destroyed, not carting them to a compost heap, for the establishment of such a virulent attack would be a real calamity to strawberry growers.

Maggot of the Wheat Bulb Fly.

Regarding crop attacks, the most important that is being reported at present is that of the maggot of the wheat bulb fly, the *Hylemyia coarctata*. This is again destructive in various places by means of the little white legless maggot feeding low down in the centre of the wheat plant, and thus destroying the shoot above it. I am trying to induce correspondents to observe in the summer whether the maggots of the next brood will be noticeable in the young shoots of 'couch grass' on fallow or partly bare land. The attack is for the most part on land fallowed in the previous year, and it is a serious one. If we could ascertain the above point we should be able to check it.

At present, the best treatment I am able to suggest is to apply a stimulating dressing to the infested wheat, which may help on side shoots of injured plants so as to ripen their heads in time for the harvest of the uninfested plants. The application can best be judged of by the owner, but I am suggesting guano and salt mixed, because wheat having a power of imbibing salt until the plant tastes strongly of it, this application added to the guano would be likely to be very detrimental to such of the young wheat bulb maggots as are still feeding in the stems.

Winter Habitat of Chlorops tæniopus.

From notes and specimens placed in my hands by Mr. Whitehead, I learn that he has been fortunate enough to secure examples, sent to him from Downton by Dr. Fream, of the much-needed observation of how *Chlorops tæniopus* (the fly which causes the very bad attack known as gout in barley) passes the winter.

It was well known in Germany that the winter attack arose from autumn flies laying their eggs on autumn sown corn or wild grass. The maggot winters in the neck of the plant, in spring the infested shoot forms a thickened growth with wide leaves, and presently the infested shoot dies, and the fly coming out from the chrysalis within starts the attack of "gout," which, regularly as the summer comes, causes loss, sometimes to a very serious extent, on barley.

This attack is easily known by the barley ear being often unable to free itself from the swelled leaf sheaf, and the plant being more or less stunted; also by the black channel showing the course of maggot injury down one side of the stem from the base of the ear to the uppermost knot.

I have repeatedly in my reports drawn attention to the importance of finding where this winter condition was passed in this country, that we might make advance towards cutting off the nurseries of summer attack, but until Mr. Whitehead placed his specimen in my hands we have not had any information sent in on the subject.

Mr. Whitehead on the 11th of May informed me that in the middle of April young wheat plants had been sent him, with chrysalids *in situ* near the base of the stem, from which on that day *Chlorops tæniopus* had emerged. A few days later he forwarded specimens for my examination, and I found the brown chrysalid of the *Chlorops* lying as he described in the heart of the plant, so near development that I could see the fly through the transparent chestnut brown case.

The widened leafage of the shoot which is a characteristic of the attack was also noticeable, and the fly on technical examination proved to be the *Chlorops tæniopus*. At first I did not feel certain of it being of this species of *Chlorops*, and therefore submitted it to the skilled examination of Mr. R. H. Meade, of Bradford, who kindly told me that he thought at first it might be the *Chlorops nasuta*, which is a very variable species, but on close examination he was convinced that it was a female of *Chlorops tæniopus*.

It is somewhat curious that this attack should be in wheat, whereas our common *Chlorops* in its summer stage in this country chiefly attacks barley. I think, therefore, that it would be very desirable to watch for what may happen in the neighbourhood of the infested land, as we may find this variety of *C. tæniopus* may have some special habits. Although it is probably too late now to search for injured shoots, yet when spring comes round again it will be well to be on the watch betimes for *Chlorops*-infested plants, which (without going into technical minutiae) may be known by the widened leaves of the attacked shoots. If once these were generally known by sight, whether in wheat, barley, or very especially in wild grasses near corn fields, we might have a good chance of lessening the summer presence very effectively by reducing the winter nurseries.

On some of the more advanced specimens forwarded by Dr. Fream there was excellent example of the uninjured stem being able to make good growth, whilst the infested shoots at the base perished, thus showing that the wheat plant being hearty will help to carry it over this form of attack, though it does not lessen the amount of infestation spread from it.

Inquiry is constantly sent regarding insect attacks, and there is steadily continued application for information regarding warble prevention.

ELEANOR A. ORMEROD.

REPORT OF THE ROYAL VETERINARY COLLEGE FOR THE FIRST QUARTER OF 1890.

INVESTIGATIONS into outbreaks of disease among farm stock have been carried on during the last quarter at the College, and several inquiries have been conducted by the officers of the College in different parts of the country.

In the beginning of the year an inquiry was made into an outbreak in a herd of beasts in Sussex. The herd was divided into seven lots located at different farmsteads; of these the disease has appeared in three. In one instance eight animals have succumbed, in another three, and in the third one.

The malady first appeared on December 26, since which time twelve beasts have died. On inquiry into the question of food and general management, it was found that all the animals were housed and fed on grain and cake of various kinds supplied from the same stock. In addition they also received hay, which was derived from several sources, and in the case of three of the farmsteads green furze was also being employed. All the grain and cake was of foreign production; it was, therefore, impossible to trace its connection with any particular source of contamination. The fact of the disease having confined itself to those farms where furze was being used is important, as this description of forage suggests an explanation of the way in which the tissues of the mouth may have been wounded, so as to admit of the inoculation of any virus to which they may have been exposed. The furze was of particularly strong growth, and the spines upon it were large and penetrating, conditions eminently calculated to injure the mouth and render it receptive of the contagion. Foreign bones for manurial purposes have been largely used on the farm, and as the disorder has not previously been known to occur upon it, these and also the grain and cakes may for the present be regarded as suspicious of having introduced the contagion there.

As means to prevention of further spread of the disease, it was recommended that all the food-stuffs then being used should be discontinued, and that the sheds and other parts of the premises with which the diseased cattle had been in contact should be thoroughly cleansed and disinfected. On these measures being adopted the disorder ceased at once.

An inspection was also made of three Jersey cows, two of which were found to have tumours in the udder. On inquiring into the family history of the animals, it was found that they were all the produce of one cow, which had been recently slaughtered in consequence of an ulcerating growth in the same organ. On a post-mortem examination being made of this animal, similar growths to that existing in the mammary gland were also found in the abdomen—near to the intestines.

The milk of the cows was submitted to microscopic examination in search after tubercular organisms, but none were found. As,

however, the cases were most probably tuberculosis, it was recommended that the use of milk for human consumption be discontinued, and that one of the affected cows be slaughtered for further examination.

Experiments in protective inoculation in *anthrax* and *swine fever* have been continued, and recently some investigations have been made in reference to the effects of inoculation with pure lymph taken from the lungs of the cattle affected with pleuro-pneumonia. The results up to the present lead to the conclusion that when the lymph is perfectly free from septic organisms no irritation nor other local or constitutional effects are produced, even when the inoculating fluid is introduced into parts of the body which are considered to be dangerous localities.

Numerous morbid specimens from cattle, sheep, and swine have been received at the College, including tuberculous deposit in lungs, liver, and other organs; hydatids in lungs and liver of cattle and sheep; and actinomyces in the glands in young cattle.

The district veterinary surgeons have reported serious losses among lambs from rheumatic swellings of the joints (joint ill), associated with inflammation of the umbilical cord (navel ill), in various parts of the country.

Investigations are now being carried on at the College in reference to the organisms of pleuro-pneumonia and swine-fever, horse-pox and cow-pox in regard to their relation to each other, and also in the effects of a new disinfectant which promises to be of some value as a preventive in contagious diseases of farm stock.

March 31, 1890.

G. T. BROWN.

QUARTERLY REPORT OF THE CHEMICAL COMMITTEE.

JUNE 1890.

1. Mr. J. A. Pearson, of Compton, Winchester, sent on March 17, 1890, a sample of uncorticated cotton-cake, which he described as bought as "pure," 47. 10s. per ton ex mill. He had made a contract for 20 tons with Messrs. Dixon & Cardus, Limited, Northam, Southampton. The analysis below was returned on March 22, 1890:—

Moisture		16.75	} 100.00
Oil		5.90	
¹ Albuminous compounds (flesh-forming matters)		16.69	
Mucilage, sugar, and digestible fibre		33.14	
Woody fibre (cellulose)		22.97	
Mineral matter (ash)		4.55	
¹ Containing nitrogen		2.67	

The cotton-cake is not a pure cake, and contains an admixture of cereal husk and starch. It contains an excessive quantity of moisture.

The following correspondence ensued :—

Compton, Winchester: April 24, 1890.

DEAR SIR,—With regard to your analysis of cotton-cake of March 22, I saw the manager (Mr. Pinhorn) and told him the cake was not pure, when he entered into a long explanation. I told him I could not remember all he said; he had better think the matter over and write me the result. Not hearing from him I wrote the following letter.—Yours truly,

Dr. Voelcker.

J. A. PEARSON.

P.S.—I may say I had no written guarantee that the cake was pure, but he told me it was, and made from the best Egyptian cotton-seed. I enclose the correspondence that has passed on the subject for your persusal.

[COPY.]

Compton, Winchester: April 7, 1890.

DEAR SIR,—With respect to our conversation with you on Saturday last about the impurity of the cotton-cake you sent us, we sent a sample of it to Dr. Voelcker to be analysed. On the other side you will find copy of his analysis, in sending which he writes as follows:—

“The cotton-cake is not a pure cake and contains an admixture of cereal husk and starch. It contains an excessive quantity of moisture.”

After your guarantee that the cake was made from pure cotton-seed we should like to know what explanation you have to offer in connection with Dr. Voelcker's analysis.—Yours truly,

J. A. & W. PEARSON.

Messrs. Dixon & Cardus.

Linseed Mills and Artificial Manure Works,
Northam, Southampton: April 8, 1890.

DEAR SIRS,—Yours to hand; the writer will be at Winchester Market on Saturday, and will see you thereon; we may say, however, that we gave no guarantee in selling you the cake.—Yours truly,

DIXON & CARDUS, Limited.

Messrs. J. & W. Pearson.

ALFRED PINHORN, Manager.

Linseed Mills and Artificial Manure Works,
Northam, Southampton: April 16, 1890.

DEAR SIRS,—Referring to ours of the 8th inst., also to our conversation, we now write to say that after duly considering the matter, that as the cake was not sold either with a guarantee or subject to Dr. Voelcker's analysis, that we must decline to enter into any controversy respecting the analysis, neither do we intend to be dictated to by the R.A.S.E. as to the way in which we conduct our business, or the terms upon which we sell; this decision was arrived at, after being fully discussed by our Directors yesterday.—Yours truly,

DIXON & CARDUS, Limited.

Messrs. J. & W. Pearson.

ALFRED PINHORN, Manager.

[COPY.]

Compton, Winchester: April 17, 1890.

DEAR SIR,—In reply to yours of this morning respecting cotton-cake, you certainly gave a verbal guarantee that the cake *was pure* and made from the best Egyptian cotton-seed, and unless you do give a written guarantee that your cakes are pure, we must decline to have any more.—Yours truly,

J. & W. PEARSON.

Messrs. Dixon & Cardus.

MEMORANDUM.

FROM

DIXON & CARDUS, Limited,
SOUTHAMPTON.

To

Messrs. J. & W. PEARSON,
COMPTON, WINCHESTER.

April 18, 1890.

GENT,—Yours of yesterday to hand; we must, however, adhere to the

terms of our letter of the 16th inst., and therefore cancel remainder of cake on contract.—Yours truly,

DIXON & CARDUS, Limited.
ALFRED PINHOEN, Manager.

Ultimately a reduction of 18s. 2d. per ton was allowed in this case.

Cakes from the same makers were also forwarded by Mr. Stirton, agent for the Earl of Northbrook, Stratton, and by Mr. S. H. Allen, of Eastover, near Andover. The analyses were as follows:—

	No. 1.	No. 2.
Moisture	16.52	15.30
Oil	5.86	5.17
¹ Albuminous compounds (flesh-forming matters)	18.31	16.69
Mucilage, sugar, and digestible fibre	31.94	36.07
Woody fibre (cellulose)	23.13	22.17
Mineral matter (ash)	4.24	4.60
	100.00	100.00
¹ Containing nitrogen	2.93	2.67

No. 1.—An impure cake. The cake was mixed with some finely ground cereal husk, and contained some quantity of starchy impurities.

No. 2.—It is not a pure cotton-cake; it contains an admixture of cereal husk.

The purchaser in each of these cases stated that the cake was verbally guaranteed as pure.

2. On February 14, 1890, Mr. E. G. Tatam, of Moulton, Spalding, sent a sample of artificial manure for analysis. The manure was said to be made from soot, fish, blood, &c., price 3*l.* 10*s.* per ton. The following analysis and report were returned February 19:—

Moisture	24.70	100.00
¹ Organic matter	12.49	
Phosphate of lime	1.32	
Oxide of iron, carbonate, and sulphate of lime, &c.	40.67	
Insoluble siliceous matter	20.82	

¹ Containing nitrogen .48 = ammonia .58.

Practically worthless. I would not care to pay as many shillings as you are paying pounds for the stuff.

3. Mr. H. Pooler, of Tibberton Manor, Newport, Salop, sent on February 26, 1890, a sample of feeding-meal sold as "Thirds or Sharps," genuine meal from wheat only, price 12*s.* per 240 lbs. The Sharps were purchased in Stafford, the manufacturers being stated to be a firm in Liverpool. The material was invoiced "Sharps"; a verbal description only of the material was given, but no guarantee in writing. The analysis below was sent on March 4:—

Moisture	11.74	} 100.00
Oil	3.10	
¹ Albuminous compounds (flesh-forming matters)	12.06	
Mucilage, sugar, and digestible fibre	54.88	
Woody fibre (cellulose)	6.03	
² Mineral matter (ash)	12.19	

¹ Containing nitrogen 1.93

² Including sulphate of lime 8.96

Adulterated with gypsum.

In answer to inquiries, Mr. Pooler wrote as follows :—

Not being satisfied with the meal on delivery, I wrote to the vendor stating I was sending sample to Dr. Voelcker for analysis.

On February 24 the vendor enclosed to Mr. Pooler a telegram from Liverpool :

“Wire customer to return Sharps, send another lot as we can take no responsibility.”

4. Mr. T. Eads, of Manor House, Yelden, Higham Ferrers, sent on February 24, 1890, a sample of linseed-cake bought from a cake merchant in Bedford. Five tons were purchased at 8*l*. 17*s*. 6*d*. per ton, delivered at Higham Ferrers Station. The following analysis was returned on March 1, 1890, with the remark, “A dirty impure cake containing over 6½ per cent. of sand” :—

Moisture	13.24	} 100.00
Oil	9.28	
¹ Albuminous compounds (flesh-forming matters)	23.19	
Mucilage, sugar, and digestible fibre	32.36	
Woody fibre (cellulose)	8.99	
² Mineral matter (ash)	12.99	

¹ Containing nitrogen 3.71

² Including sand 6.59

Mr. Eads stated that he did not trouble about having a guarantee as to purity.

5. Mr. Ernest Leycester, of the Toft Estate Office, Knutsford, sent on March 4, 1890, a sample of what he called “Fish Guano” for analysis. One ton of the material had been purchased, price 3*l*. 10*s*. delivered, from the Phosphate Fish Bone Guano Company (H. Hamilton, Manager), of Central Buildings, North John Street, Liverpool, through their local agent, Mr. G. Eden, Bull’s Head Inn, Mobberley. Upon the Company’s invoice the material was described as “Phosphate Fish Bone Guano.” The following is from the Company’s circular :—

The Phosphate Fish Bone Guano Co., Central Buildings, North John Street, Liverpool, are opening out a new industry on the coasts of the great sea fisheries, and are manufacturing a very powerful and cheap guano, delivered carriage free at 3*l*. 10*s*. per ton.

It is well known that fish bone and other refuse, when in a dry, powdered condition, is extremely rich in phosphates, ammonia, potash, soda, saline, and other salts, and has proved to be the best and richest fertiliser in the world.

The circular continues :—

It is a well-balanced guano, and works very similar to farm-yard and stable manure, consequently it is exceedingly suitable for all kinds of plants and crops, only, it being in a concentrated condition, it acts more quickly, &c., &c.

Being a production from the sea, its potash and saline salts effectually destroy the larvæ and germs of ground grubs, slugs, and all insect life, &c.

The following analysis was sent on March 14 :—

Moisture	2.95	100.00
Organic matter	6.35	
Phosphate of lime	1.53	
Alkalies, magnesia, oxide of iron, &c.	3.32	
Sand	85.85	
Containing nitrogen	.63	
Equal to ammonia	.76	

When sending this, Mr. Voelcker wrote :—

As you will see by the certificate, 86 per cent. of it is sand, and it contains only $1\frac{1}{2}$ per cent. of phosphate of lime, and $\frac{3}{4}$ per cent. of ammonia. The material has no right to be called Fish Guano, and is almost worthless.

Upon receiving this report, Mr. Leycester wrote, on March 17 :—

The “guano” was purchased by a small tenant on this estate. . . . I find that two or three other tenants on this estate have been persuaded into the purchase of this manure, so-called. I was so struck by appearance and feel of the stuff, being familiar with real Fish Guano, that I felt convinced there was something wrong, but confess that I was unprepared for the presence of so large a percentage of sand. The vendor, who is agent, probably knows nothing of the nature of what he sold; he went round *with samples* taking orders, and, from what I gather, succeeded in getting a good many.

Referring to the statement in the circular that the guano was sold on guaranteed analysis, Mr. Leycester wrote, on March 20 :—

I had advised tenant who had purchased the compound to apply for analysis of the same. Instead of a reply by post he received a visit from some man from the vendor, who told him that there had been a mistake and that no charge would be made for the “manure” supplied. The visit was followed the next day by the letter which I enclose.

The Phosphate Fish Bone Guano Company,
Central Buildings, North John Street, Liverpool.
March 18, 1890.

DEAR SIR,—Our representative informs us that he called upon you to-day, and acquainted you with the fact that we had strong reason to believe that the manure you received had in some way been sent out not up to our guaranteed analysis. We are inquiring as to how this could have occurred, and beg to assure you that our manager had strict orders to send out each order exact as to quality, and, but for some remarks made amongst the men,

we should not have known that we were being deceived. As our representative told you, we will send you another ton in the place of that you have.—Yours respectfully,

J. Worthington, Esq.,
Wood End, Moberley.

THE PHOSPHATE FISH BONE GUANO COMPANY.
per H. HAMILTON.

Two other samples of the same material have been analysed with the following results:—

Moisture	3.43	0.94
¹ Organic matter	20.27	2.23
Phosphate of lime	5.18	.95
Oxide of iron, alkalies, magnesia, &c.	12.08	3.30
Sand	59.04	92.58
	100.00	100.00
¹ Containing nitrogen	1.47	.29
Equal to ammonia	1.78	.35

6. The following cases illustrate the uselessness of such a guarantee as “made from 96 per cent. linseed.”

(a.) Mr. J. A. Gordon, of Arabella, Nigg, Ross-shire, sent on March 11, 1890, a sample of linseed-cake, guaranteed “made from 96 per cent. of pure linseed.” Twelve tons had been purchased at 8*l.* 4*s.* 2*d.* per ton. The following analysis was returned, and the cake reported as being mixed with locust beans:—

Moisture	10.25	} 100.00
Oil	13.13	
¹ Albuminous compounds (flesh-forming matters)	27.12	
Mucilage, sugar, and digestible fibre	30.54	
Woody fibre (cellulose)	8.66	
Mineral matter (ash)	4.30	
¹ Containing nitrogen	4.34	

Mr. Gordon, in answer to inquiries, said that “the manager states that his men had, through carelessness, mixed a little locust beans with the cake before being made.”

(b.) Mr. W. J. Gross, of Burton Latimer, Kettering, sent on March 8, 1890, a sample of linseed-cake. The following analysis was returned on March 13:—

Moisture	12.65	} 100.00
Oil	9.23	
¹ Albuminous compounds (flesh-forming matters)	25.44	
Mucilage, sugar, and digestible fibre	33.46	
Woody fibre (cellulose)	9.87	
² Mineral matter (ash)	9.35	
¹ Containing nitrogen	4.07	
² “ sand	3.95	

A dirty cake.

Mr. Gross wrote saying that he bought the cake as pure, price 9*l.* per ton. The cakes were marked “guaranteed made of linseed

imported on basis of 96 per cent. purity and doubly screened." The cake, however, was not invoiced as pure, and the vendor refused to put the word pure in the invoice, but stated that he sold it as guaranteed on the cakes.

To an inquiry from Mr. Gross, Mr. Voelcker replied :—

The linseed cake, sample of which you sent to me in March, was, as I informed you, a dirty low-quality cake. I really do not know what you can do in the matter, as the cake was not guaranteed pure. I can only say that a cake made from seed of 96 per cent. purity, and subsequently doubly screened, certainly would not contain (practically) 4 per cent. of sand.

For the price you paid you should expect to get a really pure and high-quality cake; the cake you got was neither the one nor the other.

(c.) Mr. H. Padwick, of Manor House, Horsham, sent on April 18, 1890, a sample of linseed-cake, price 7*l.* 15*s.* per ton. The vendors, in offering the cake, stated that the above cakes are guaranteed to be made from Calcutta linseed bought on a basis of 96 per cent. purity. The analysis of the cake was as follows :—

Moisture	10.05	} 100.00
Oil	9.40	
¹ Albuminous compounds (flesh-forming matters)	81.62	
Mucilage, sugar, and digestible fibre	30.78	
Woody fibre (cellulose)	9.20	
² Mineral matter (ash)	8.95	
¹ Containing nitrogen	5.06	
² Including sand	3.60	

Contains far too much sand, and is not a pure cake.

An allowance of 10*s.* per ton was made in this case.

7. Mr. W. H. Goodall, of Stoke Grange, Market Drayton, sent on May 1, 1890, a sample which he described as "bones," price 5*l.* per ton delivered at station. The following analysis and report were returned on May 7 :—

Moisture	21.06	} 100.00
¹ Organic matter	19.52	
Phosphate of lime	41.68	
² Carbonate of lime, &c.	16.09	
Insoluble siliceous matter	1.65	
¹ Containing nitrogen	1.68	
Equal to ammonia	2.04	
² Including sulphate of lime	7.23	
" chloride of sodium	3.60	

This sample is a boiled bone adulterated with sulphate of lime and salt.

3rd June, 1890.

(Signed) EMLYN, *Chairman.*

REPORT OF THE EDUCATION COMMITTEE ON THE RESULTS OF THE SENIOR EXAMINATION OF MAY 1890.

THE Committee have to report that seventeen candidates entered for the Senior Examinations held on May 13 and four following days, and that, with one exception, these candidates duly presented themselves for examination.

2. The following Table shows the results of the examination in each year from 1868, when the Senior Examination was first instituted, until the present time :—

Year	No. of candidates examined	Passed		Year	No. of candidates examined	Passed	
		First class	Second class			First class	Second class
1868	18	No award	No award	1880	8	4	1
1869	18	2	8	1881	12	3	1
1870	2	No award	No award	1882	9	1	—
1871	4	2	1	1883	19	6	—
1872	8	5	—	1884	7	2	1
1873	9	3	—	1885	12	3	1
1874	10	1	—	1886	21	4	1
1875	6	2	—	1887	7	3	1
1876	4	2	2	1888	13	3	5
1877	8	1	2	1889	24	10	6
1878	6	1	—	1890	16	6	5
1879	12	3	—	—	—	—	—
—	—	—	—	Total	253	67	35

3. Of the sixteen competitors, eleven have satisfied the Examiners; and the following candidates, placed in order of merit, have gained first-class certificates, and thus become Life Members of the Society; the first four being entitled in addition to the prizes stated below :—

1. FRANCIS REGINALD ARMYTAGE, 4 Pump Court, Temple, E.C.
First Prize of 25l.
2. RICHARD WILLIAM HAYDON, Great Coombshead, North Molton, Devon. *Second Prize of 15l.*
3. HENRY CRABTREE, 30, Lutton Place, Edinburgh. *Third Prize of 10l.*
4. ALFRED HENRY INMAN, 9 Queensferry Street, Edinburgh.
Fourth Prize of 5l.
5. JOHN JAMES JEFFRAY, Blackaddie, Sanquhar, N.B.
6. RICHARD HENDERSON, Portland Estates Office, Kilmar-nock, N.B.

4. The following candidates, having passed in Agriculture and in three of the other four compulsory subjects, have been awarded Second Class Certificates :—

7. EDWARD DOUGLAS MALCOMSON HAMILTON, Magherabuoy, Portrush, Co. Antrim.
8. JOHN ARTHUR LLEWELLYN BEASLEY, Aylestone, Leicester.
9. GEORGE PELHAM THOMAS, Hemsworth, Wakefield.
10. JAMES GUNTER, Estate Office, Glasbury.
11. GEORGE SHARMAN MITCHELL, Cannon Street, Belgrave, Leicester.

5. Of the compulsory subjects, there were two failures in Agriculture, eight in Chemistry, four in Book-keeping, four in Land-surveying, and two in Agricultural Engineering. Of the optional subjects there were no failures in Geology, but four in Botany, three in Anatomy, and one in Agricultural Entomology.

6. The Examiner in Agriculture (Mr. Thomas Bell) reports that:—

“The farming experience of candidates who came up for examination having been obtained in widely separated districts of the United Kingdom, ranging from the North of Ireland and the North of Scotland to the southern counties of England, their descriptions of the management of sheep and cattle could not be otherwise than varied. The diversity of treatment entailed by the differences of climate and situation—which necessarily influence local customs—was carefully taken into consideration. The time at disposal for the *vivâ voce* examination was too limited to elicit sufficiently the experimental knowledge of some of the candidates whose papers were fair, but who did not come out so well when examined on the details of dairying and of the production of beef and mutton.

“The answers to questions as to rotation of crops, cultivation, manuring, and amount of produce were generally satisfactory; but great divergence of opinion was expressed as to the quantities, varieties, and cost of grass and cover seeds desirable for grass in rotation to lie three years. There was also a great disparity in the replies as to the amount of work which a man and a pair of horses should accomplish in a given time.

“Those candidates who had been engaged in the practical work of the farm were free from the hesitation and uncertainty which some of the more theoretical students displayed.”

7. Eight of the candidates, or half of the total number, failed in chemistry. The Examiner in General Chemistry (Prof. Liveing) speaks well of the work of the three candidates who received the highest number of marks in the subject. The Examiner in Agricultural Chemistry (Mr. R. Warrington) remarks that “the *vivâ voce* examination proved that many of the candidates had a very slender acquaintance with the practical side of agricultural chemistry. Four failed to obtain half-marks in the *vivâ voce* examination, and four others only a little exceeded this. Six of the candidates when shown Peruvian guano could not tell what it was, or gave ridiculous answers. The results of the written examination were better. The *arbitrational* question (5) [see page 427] was generally well done. The

worst answers were to questions 1 and 3; of the answers to the last-named question only five obtained over half-marks."

8. The Examiner in Book-keeping (Mr. C. Gay Roberts) reports that the papers do not call for any detailed comment, and that the work as a whole was fairly done.

9. The Examiner in Mensuration and Land Surveying (the Rev. Prof. Twisden) reports that "the constructions asked for in some of the questions were on the whole made neatly and accurately, though of course some candidates did better than others. The right answer was in no case obtained to question 3 [see page 427], though three or four of the candidates took it in hand the right way. Correct results were often found in answer to questions 4 and 5, and the data in question 6 were in many cases arranged rightly, and the section correctly drawn. In question 8 the calculation was not once made, and the construction in most cases was wrong. Questions relating to principles (such as question 7 and the latter parts of questions 4 and 5) seldom brought out good answers. This point might be stated in another way, viz. that the work is too much done by rules, the reasons for which are not understood."

10. The Examiner in Agricultural Engineering (Dr. Wm. Anderson) states that the examination was upon the whole satisfactory, and that the oral work was better than the written. He again draws particular attention to the very bad sketching, and expresses his surprise that more pains are not taken to teach young men how to draw. He remarks that most Board School boys would have made better sketches than those submitted to him; and he hopes that greater encouragement will be given to drawing, especially making sketches with dimensions marked thereon.

Name of candidate	Age of candidate	Agriculture, Paper, max. 200	Agriculture, viva voce, max. 100	Chemistry, max. 200	Book-keeping, max. 200	Land surveying, max. 200	Agri. engineering, max. 200	a. Botany, max. 100	a. Geology, max. 100	a. Anatomy, max. 100	a. Agri. Entomology, max. 100	Total Marks
*Armstrong, F. R.	40	153	80	141	180	168	180	62	92	65	100	1,221
†Beasley, J. A. L.	22	139	68	+	180	120	152	+	61	+	+	700
+	19	+	55	+	110	+	+	51	53	+	73	+
+	18	149	55	+	+	100	+	—	—	+	+	+
*Crabtree, H.	23	145	65	159	120	117	144	75	89	55	80	1,049
†Gunter, J.	30	151	95	+	110	100	140	—	—	50	—	646
†Hamilton, E. D. M.	26	130	80	108	105	+	158	68	79	—	75	801
*Haydon, B. W.	29	191	95	149	160	119	140	71	79	+	78	1,079
*Henderson, R.	41	152	70	125	175	102	100	—	—	—	—	724
*Inman, A. H.	27	133	50	144	145	122	160	68	69	60	72	1,013
*Jeffrey, J. J.	19	168	85	135	170	105	154	—	—	—	—	817
+	20	140	80	+	125	+	150	+	57	50	87	+
†Mitchell, G. S.	22	142	60	+	100	130	120	—	—	—	—	552
+	23	146	85	+	+	+	108	+	68	—	100	+
†Thomas, G. P.	26	113	75	109	+	115	130	+	54	+	58	654
+	35	+	+	+	+	123	126	—	—	—	—	+

REMARKS.

* First-class certificate and life membership.
 † Second-class certificate.
 a Optional subjects.

— Did not attempt.
 + Failed, not having obtained half the maximum marks in the subject.

11. Of the four optional subjects, the Examiners in Botany and Geology (Mr. W. Carruthers and Prof. Rupert Jones) make no comments upon the quality of the papers in these subjects. The Examiner in Anatomy and Animal Physiology (Prof. J. B. Simonds) reports that the papers upon the whole are scarcely equal to those of former years, and some of the candidates omitted to answer all the questions. The subject of Agricultural Entomology is included in the syllabus for the first time this year; and it is gratifying to find that considerable attention appears to have been devoted to it by the students. Only one candidate failed out of ten who entered for the subject, whilst two obtained full marks. The Examiner (Miss E. A. Ormerod) expresses satisfaction that "students are now taught to combat insect attacks by agricultural measures, which is a great advance on former days;" and she points out "the importance of agricultural students being instructed how to distinguish better between the grub of a fly, of a beetle, and of a moth."

12. The Table on p. 423 gives the marks assigned by the Examiners to the work done by each candidate in the several subjects.

June 3, 1890.

(Signed) JOHN DENT DENT, *Chairman*.

EXAMINATION IN AGRICULTURE.

MAXIMUM NUMBER OF MARKS FOR THIS PAPER, 200. PASS NUMBER, 100.

Tuesday, May 13th, from 2 p.m. till 5 p.m.

1. Give a detailed inventory, with prices, of the live and dead stock requisite at this date, for a farm of 650 acres—150 acres of which are good dairy or fattening pasture and meadow; 200 acres dry, friable, arable land; and 300 acres upland sheep-walk.

2. Sketch suitable buildings for this farm, including cottages for the labourers, and append a descriptive schedule.

3. Shortly describe the management of a herd (state breed) where the cows, in addition to dairy produce, are intended to provide bullocks to be fattened on the pastures, and heifers to keep up the herd.

4. What gross profits would you expect per head per annum, and state how derived; from (a) the cows, (b) their produce, until the latter are sold fat or returned to the herd for breeding?

5. What means would you use to ascertain the value of an animal when ripe for the butcher?

6. Give a rotation of crops for the arable land on the Farm in question No. 1. State acreage on each share, and gross value per acre, of an average crop at current prices.

7. How many acres should a man and a pair of horses ridge up for mangel in a day of 9 hours? State width of ridges.

8. What manures would you apply for mangel, including farmyard dung? State quantity and cost per acre of each variety.

9. Describe the implements used, and the process of cultivation for a grain crop, of a field where turnips had been folded with sheep; state approximate date of sowing, kind and quantity of seed per acre.

10. Describe the subsequent preparation and the sowing down of the same land with grass and clover seeds to lie three years (1st year hay, and 2 years pasture). State what varieties of seeds you would use, with the quantity and cost of each per acre.

11. State what breed of sheep you would keep in the Midlands, and describe

how you would keep the flock of lambs on the farm in question No. 1, from the time of weaning until they were shorn and sold fat in the latter part of April, giving approximate dates for changes of food. Give the weight per head of carcass and the wool you would expect to realise.

12. What different treatment would you give the ewe lambs that are intended to take the place of draft ewes?

13. State the points you deem essential in a shire-bred stallion, and the faults that should disqualify a mare to mate with him; especially noting hereditary diseases.

VIVÂ VOCE EXAMINATION IN AGRICULTURE.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Wednesday Afternoon, May 14th.

EXAMINATION IN BOOK-KEEPING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Friday, May 16th, from 10 a.m. till 1 p.m.

1. State the advantage and the disadvantage of book-keeping by double entry as compared with book-keeping by single entry.

2. Open a Ledger for the Farm Account of Thomas Rogers, who had on Sept. 29, 1888:

	£	s.	d.
Corn valued at	540	0	0
Horses valued at	160	0	0
Live Stock (including Cattle, Sheep, Pigs, and Poultry) valued at	1,250	0	0
Implements valued at	350	0	0
Foods and Manures purchased, valued at	170	0	0
Petty cash	15	9	0
Debt due from H. Jones	45	0	0
And whose liabilities were			
Amount owing to Sir R. Blake for Rent	100	0	0
And to Martin & Co. Bank Account over- drawn	241	7	3

Journalise and post into the Ledger the following transactions. Make out a Profit and Loss Account and a Balance sheet for Sept. 29, 1889.

T. Rogers draws cheques during the year for:

Wages	850	10	0
Seeds	41	7	6
Rent	450	0	0
Rates, Taxes, and Insurance	90	3	0
Manures	149	6	0
Tradesmen's Bills	203	5	0
Feeding Stuffs	538	4	3
Sheep	575	0	0
Pigs	24	3	0
He buys of H. Jones 30 bullocks at 15 <i>l.</i> each, and pays him	405	0	0
He draws cheques for petty cash	75	0	0
He buys new Implements for	30	0	0
and at Michaelmas reckons 8 per cent. for depreciation of Implements.			
The rent that becomes due for the 12 months is	400	0	0

He receives and pays into the Bank :		£	s.	d.
Sheep sold		802	10	0
Wool "		45	7	6
Cattle "		750	0	0
Pigs "		245	6	9
He sells to Thompson, Dairy Produce, 182½ 7s. 6d. and receives on account		171	3	4
He receives Corn Produce		839	8	0
He sells to Thompson, Hay and Straw 175½ and receives from him on account		150	0	0

On Sept. 29, 1889, his valuations are :

Corn unsold	660	0	0
Horses "	140	0	0
Sheep "	650	0	0
Cattle "	540	0	0
Pigs "	40	0	0
Poultry "	5	0	0
Seeds "	20	0	0
Hay and Straw unsold	180	0	0
Growing Crops "	700	0	0
Foods purchased "	90	0	0
Manures "	94	0	0
He has petty cash in hand	7	6	2
His unpaid Tradesmen's bills amount to	45	3	1

EXAMINATION IN CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

A. GENERAL CHEMISTRY.

Thursday, May 15th, from 10 a.m. till 1 p.m.

1. How can nitrogen be distinguished from other gases? How can it be brought into combination with oxygen? How can you detect the presence of nitric acid, and of nitrous acid?

2. Mention gases easily soluble in water, and others which are but little soluble. State how the solubility of a gas in water is affected by temperature and by pressure; and give facts, or experiments, in proof of your statement. What are the gases usually held in solution in freshly fallen rain?

3. Describe the preparation of hydrochloric acid, and explain the chemistry of the process. Explain the action of that acid with caustic soda, metallic iron, red lead, and nitric acid, respectively.

4. What are the chief sources of ammonia? State the composition, by weight and by volume, of ammonia; and give an account of its properties. How can you obtain ammonia from the sulphate, and what weight of ammonia will 1,000 grs. of the sulphate give?

5. Describe the preparation and properties of sulphuretted hydrogen. Explain its action with (1) white lead, (2) slaked lime, (3) ferric chloride.

6. Explain the chemistry of lime-burning, and give the chemical characters of lime. Explain the differences in the characters of limes obtained from different kinds of limestone. What is the chemical action of slaked lime with (1) sodium carbonate, (2) ferric chloride, (3) common sodium phosphate?

7. Describe the chief characters of zinc; and the effects of acids, alkalis, and exposure to the weather, upon it. How is iron galvanised?

8. State the chemical composition of starch, and describe its chief properties and its mode of occurrence. Explain the relations between starch, gum, sugar, and cellulose.

9. Explain the general chemical constitution of fats. How do mineral oils, and such oils as oil of turpentine, differ from fats? Explain the chemistry of the conversion of fat into soap.

B. AGRICULTURAL CHEMISTRY.

Thursday, May 15th, from 2 p.m. to 5 p.m.

1. Write a paper on the humus of soil. Describe (1) its origin and nature; (2) the conditions which favour its increase, and diminution; (3) the part which it plays in the soil.

2. Describe the special characteristics of the manure yielded by horses, cattle, sheep, and pigs. What are the conditions which determine the production of (1) a valuable, and (2) a poor, manure? What losses is farmyard manure liable to, and how are they best prevented?

3. Write a paper on the agricultural chemistry of the mangel crop. To what extent is it an exhaustive crop? What are its natural capacities for drawing food from the soil? What should be the characteristics of the manure when a full crop is desired? How is the composition of the root affected by (1) thick or thin planting; (2) character of manure; (3) character of season?

4. What do you understand by the following terms?

Monocalcic phosphate.

Amide.

Reduced phosphate.

Lignin.

Meat guano.

Malt dust.

Cinereal.

Peptone.

5. A horse is fed with hay containing in 100 parts—albuminoids 10.3, fat 2.6, soluble carbohydrates 41.6, fibre 25.0. The digestion coefficients are for albuminoids 57, fat 24, carbohydrates 55, fibre 36. Calculate the albuminoid ratio of the diet.

6. What is the nature of rennet? How is it prepared? Describe its action on milk, and the influence of external conditions upon this action.

EXAMINATION IN MENSURATION AND LAND SURVEYING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Tuesday, May 13th, from 10 a.m. till 1 p.m.

1. What is the length of a chain in yards, and of a link in inches? What is the advantage of using a chain for making the measurements from which areas of land are to be obtained?

A rectangular piece of land is 42 chains 15 links long, and 13 chains 73 links wide; find its area (a) in acres, (b) in square yards.

2. Draw a straight line A C, and in it take two points, N and M; A N = 107 ft., A M = 230 ft.; A C = 412 ft.; N D and M B are perpendiculars to A C, drawn to the right and left respectively of a man looking from A to C; N D = 184 ft., M B = 155 ft.; draw A B O D to a scale of 75 ft. to an inch, and note the length of B C, and the number of degrees in the angle A D C.

3. A hundredweight of seven-strand straining wire is 650 ft. long; find the diameter of each wire, assuming the specific gravity to be 8.

N.B.—You may take $7\pi = 22$; the calculation will be simplified by the use of logarithms.

4. State the common practical rule for finding the volume of a piece of round timber. Apply it to find the volume of the trunk of a tree, which is 45 ft. long and 156 in. round in the middle.

For what reasons would you expect the result to be inexact? On which side would the error commonly be?

5. A hole is dug in level ground; its top is a rectangle 100 ft. long and 50 ft. wide; its bottom is an horizontal rectangle, with its sides parallel to the sides of the top, 80 ft. long and 40 ft. wide; its depth is 8 ft.; find the number of cubic yards moved in digging it.

Draw a plan of the hole, assuming that two of the adjacent sides of the hole are vertical. State whether in this case the volume would differ from

what the volume would be if all the sides had equal slopes, and give a reason for your answer.

6. A, B, C, D are four successive points, and their horizontal distances are as follows:—A to B = 2 chains, A to C = 6.30 chains, A to D = 12.10 chains; when a spirit level is between A and B and the staff is first at A and then at B, the backsight reading is 6.78 ft. and the foresight reading is 1.05 ft.; similarly, between B and C, backsight 5.82, foresight 3.47; between C and D, backsight 2.74, foresight 6.25. Arrange these measurements in the form of field-book entries, and draw a section of the ground, using for the horizontal scale 1 in. = 2 chains, and for a vertical scale 1 in. = 10 ft. The datum line may be assumed to be 10 ft. below A.

7. Explain the principle of the Vernier.

A scale a foot long is divided into 100 equal parts; construct a vernier for the scale, by means of which it can be read to thousandths of a foot.

N.B.—By “construct” is meant, draw a line of the actual length of the vernier and divide it into the requisite number of equal parts.

8. A, B, C are three points; at A, A B bears N. $65^{\circ} 30'$ E.; at B, B C bears N. $27^{\circ} 15'$ W.; from A to B is 1,000 yards, and from B to C is 700 yards; calculate the bearing of A C at A and verify the result by construction.

EXAMINATION IN AGRICULTURAL ENGINEERING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

Wednesday, May 14th, from 10 a.m. till 1 p.m.

N.B.—*Not more than half the questions should be attempted.*

1. Suppose a brick wall 20 feet high and of uniform thickness is required to resist a wind-pressure of 20 lbs. per square foot acting uniformly over its surface; explain how you would decide on the thickness of the wall so as to enable it to stand the wind-pressure safely.

2. A handspike 12 feet long is employed to raise a stone. The fulcrum is placed 2 feet from the stone and a labourer presses the end of the lever down with a force of 120 lbs. Calculate the lifting pressure on the stone and the pressure on the fulcrum.

3. Explain what is meant by “Work” and by “Horse-power,” and give some illustrations.

4. Explain what is meant by the “Mechanical Equivalent of Heat,” what is its numerical value, and show how it is applied in calculating the efficiency of heat engines.

5. Explain the method of calculating the heat capable of being developed by a fuel the chemical composition of which is known.

6. Describe briefly the chemical composition of the atmosphere, and the principal properties of air.

7. Explain how the column of mercury is supported in a barometer, and show what is the maximum height to which a pump may be expected to suck water. The specific gravity of mercury is 13.4.

8. A stream of water with a fall of 15 feet is available for driving the machinery of a homestead. It is desired to secure a clear 12 horse-power; how many gallons or cubic feet of water per minute will be required to yield the necessary power? The efficiency of the motor may be taken at 60 per cent.

9. Sketch a single-flue Cornish boiler and its setting, giving the main dimensions.

10. Sketch an ordinary hemp-packed gland for a $2\frac{1}{2}$ -inch piston rod, and give the main dimensions of the parts.

11. Describe the cycle of operations in the “Otto” gas-engine as made, for example, by Crossley Brothers.

12. Describe the system of steam ploughing by means of two hauling engines.

13. What is the difference between a cultivator and a plough? Illustrate your answer by sketches.

14. Describe an ordinary sowing drill and sketch one of the sections.

15. Discuss the advantages of pressing hay and straw for transport, and describe any one of the hand presses now generally in use.

16. Describe and sketch a turnip-slicer and pulper. Point out the difference between the two implements.

17. Describe and sketch a plumber block or pedestal bearing for a 2½-inch shaft and a flange coupling for the same.

18. Describe the process of getting up steam, starting with an empty boiler, and state what instructions you would give a driver for working it.

EXAMINATION IN BOTANY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Saturday, May 17th, from 10 a.m. till 12 noon.

Seven questions at least must be answered.

1. Give the distinguishing characters of Dicotyledons and Monocotyledons.

2. Describe the nature and functions of stomata.

3. What are the organs that are modified for storing food in the potato, artichoke, onion, turnip, kohl-rabi, and carrot?

4. What is meant by an epiphyte, a parasite, and a saprophyte? Give examples.

5. What are the conditions required for the germination of a seed?

6. Explain the conditions and structure of the root which fit it for absorbing food from the soil.

7. Explain the changes that take place in a grain of wheat in malting.

8. Give from the British flora two examples of plants that ensnare insects. State how this is done in the examples given, and explain how the plants benefit from the capture.

9. Give the characters of the natural order Cruciferae, and specify some of the cultivated plants which belong to the order.

10. Name and describe in systematic order the plants marked A and B.

EXAMINATION IN GEOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Friday, May 16th, from 2 p.m. till 5 p.m.

1. From the decomposition of what Rocks are different Soils supplied with Lime, Potash, Magnesia, and Silica?

2. What is Clay? What particular kinds of Clay are used in Manufactures and Building? Where are such Clays respectively obtained?

3. Refer to the different states and conditions in which Water exists as a disintegrating and denuding agent on the Earth's surface; and describe in detail its action in one or more instances.

4. Describe, and illustrate by diagram, what is meant by *dip* and *strike*. Show also how they affect the surface of England, as to its physical geography.

5. What is a Fossil? Mention some Fossils with which you are well acquainted, and state what you know about them and their origin (whether animal or vegetable), the conditions under which they occur, and to what particular Geological Formations they belong.

6. Suppose that you have to make a Road along a Valley, in which the strata *strike* along the valley, and *dip* in the same direction on both sides, on which side would you prefer to make the Road? Give your reasons for the choice.

7. Write a brief essay on the Geology and Physical Geography of any large County in England, Wales, Scotland, or Ireland. Give one or more sketches and diagrams in illustration.

8. What are the natural causes of the Eastern and South-eastern parts of England being distinguished for Agriculture, and of some other parts having many more Manufactures?

9. Define *marl*, *shale*, *schist*, *slate*, *basalt*, and *granite*. For what purposes are these used? Where in the British Isles are the last three found in abundance?

10. Mention some of the best districts for Sheep-walks, Grass-lands, and Corn-fields in England, and state the geological reasons for their existence.

11. From what material is Lime obtained? Describe the process and its results. In what does Hydraulic Lime differ from common or simple Lime?

12. Name and describe the Specimens on the Table.

EXAMINATION IN ANATOMY AND PHYSIOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Saturday, May 17th, from 2 p.m. till 4 p.m.

1. Describe the action of the saliva on the food; name the chief sources of its supply, and the means by which it is conveyed into the mouth.

2. Describe the process of chylification, and say in what part of the digestive system the chyle is chiefly deposited and how it is conveyed thence into the general circulation; name also the blood-vessel into which it enters.

3. Name the blood-vessels especially connected with the liver, and say in what essential particular its secretion differs from that of other glands; also name the chief use of the secretion in the assimilation of the food.

4. Give a general description of the circulation of the blood, and especially describe the changes which it undergoes in the systemic and pulmonic vessels.

5. Name the several membranes which constitute the so-called coats of the stomach and intestines, and explain the physiological function of each.

6. Describe the physiology of impregnation, noting especially the site where the process of development of the embryo commences. State also the period of utero-gestation in the cow, the ewe, and the pig.

7. Name the chief indications of *approaching* parturition in a *heifer*, and state the absolute proofs that labour has commenced and the means by which the birth of a foetus is effected.

8. Describe the general anatomy of the mammary gland—udder—of the cow, naming especially the vessels which convey the blood to it for the secretion of milk and those which take back the unused blood into the general circulation.

9. Give the names of the bones and other structures which are combined in the formation of the foot of the ox. Name also the provision which exists for the growth of the hoof, and, as working oxen are frequently shod in some districts, state the structures which in nailing on the shoe must be carefully guarded against injury.

10. In dishorning an ox name the several structures, in their natural order, which are cut through; also the connection which the cavities thus laid open have with others normally existing both in horned and polled animals, and not naturally exposed to the direct action of the air. Name also the ill-effects which very often attend the operation.

EXAMINATION IN AGRICULTURAL ENTOMOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

Saturday, May 17th, from 12 noon till 1 p.m.

Candidates will not be expected to answer all the questions on this paper. The replies are to be as short as possible, and where the candidate is not acquainted with the scientific name of an insect, the generally received English name will be accepted.

1. Name some of the kinds of insects which are injurious to various kinds of field crops, as—to corn and grass, or fodder crops, and root crops.
 2. Describe in plain words, and as shortly as you can, the appearance of one or more of the above kinds of insects in its different stages; its method of injury to the plant; where it goes into chrysalis state; and any point of useful interest connected with it.
 3. How do you know the difference between the maggot of a two-winged fly, and a beetle grub, and the caterpillar of a moth or butterfly; speaking generally and not noting exceptional cases?
 4. Mention any kind of grub or maggot specially found to infest crops on broken-up pasture or clover ley. How would you prevent this happening?
 5. Name the insect attacks which are most frequently injurious to corn crops.
 6. Give in a few plain words a description of the appearance of one or more of the above injured crops—as, whether the straw is elbowed down, or cut off, or the grain shrivelled, and so on.
 7. Give some examples of treatment of seed or of land; or of any application, or treatment, or special rotation of crops which are practically useful to prevent any of these attacks, or to carry an attacked crop through up to a fair yield.
 8. Give the reason why such treatment is useful.
 9. Describe the ox warble maggot and its life history in the hide.
 10. Mention the best methods of remedy and prevention of warble attack.
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Notes, Communications, and Reviews.

THE MARKET VALUE OF THE DIFFERENT SAMPLES OF WHEAT AND BARLEY GROWN IN 1889 ON THE EXPERIMENTAL PLOTS AT ROTHAMSTED.

(Communicated by the Lawes Agricultural Trust Committee.)

THE experiments on the continuous growth of wheat and barley at Rothamsted were designed and have been carried out for the determination of scientific problems. It was no part of the plan to discover how to produce the largest and best crops, or to determine the most profitable manuring for different crops. Yet the investigations have supplied in their course many results which have been of practical value to the farmer. The annual estimates of the average wheat crop of the United Kingdom, published by Sir J. Bennet Lawes, have been based on the produce of the experimental crops in Broadbalk field.

The Lawes Agricultural Trust Committee wished to ascertain the commercial value of the wheat and barley from the plots harvested in 1889. With this view they obtained the assistance of a skilled valuer who examined all the samples and reported to the Committee, Dr. Gilbert supplying some observations on the valuer's report. The Committee resolved to offer the report and observations to the Royal Agricultural Society for publication in their Journal, and placed the documents in the hands of a sub-committee (consisting of Sir J. H. Thorold, Mr. Whitehead, and Mr. Carruthers) to prepare a statement of the results suitable for publication.

The only matter that is new in this communication is the market value of the crops. Though it is impossible in perusing the data here given to avoid reading the lessons which they teach, it is most necessary to bear in mind that the data refer only to one year, and that the observations of future years may greatly modify the conclusions legitimately proceeding from those of 1889.

The reader must also bear in mind that as the arrangement of the manures of the different plots is based on actual and comparative composition, regardless of cost, the market values of the grain supplied by the valuer cannot be used to determine the actual or comparative profit or loss per acre on the different plots; and, further, that the manures are not the only influences which affect the growth and productiveness of the crops. Lawes and Gilbert have shown in various memoirs that both the quantity and quality of the crop depend, in the first instance, on the fitness of the varying climatic conditions—the temperature, moisture, and sunlight—to the different stages in the life of the plant.

A. WHEAT.

The first experimental wheat crop in Broadbalk field was grown in 1844, so that the crop of 1889 was the forty-sixth in succession on the same land. The same description of manure has been applied to the same plots for 36 years (from 1852), and indeed, with some exceptions, since the beginning of the experiments.

Until 1876-7 the manures were applied in the autumn, before the seed was sown, except the nitrate of soda which was used in spring. In consequence of the loss of nitrogen by drainage, the ammonia salts, as well as the nitrate, were applied in spring for the six crops 1878-83; since 1884 each ammonia plot has received 100 lb. of ammonia salts in the autumn with the minerals, and the balance as a top-dressing in spring. The only exceptions are Nos. 25 and 26, which, since 1878, have had the whole of the ammonia salts applied with the minerals in autumn.

The plots are six-tenths of an acre in size. They have been divided into two equal portions, except those unmanured, those with farmyard manure, and that with rape-cake. Both portions have been similarly treated since 1880; but previously one-half had received at first a mixture of soluble silicates in addition to the other manures, and afterwards the straw produced on the plots was cut and applied. This has, however, been discontinued since 1880. The half-plots receiving this exceptional treatment are numbered in Table I. on page 434 as 5, 7, 9, 11, 13, 17, 19, 21, 23, 25, 27, 29, 31.

The valuer went down to Rothamsted to value the samples on October 25, 1889. The average market price of home-grown wheat in England on that date was 30s. 4d. per quarter.

On the results tabulated here, Dr. Gilbert observes:—"It is seen that, if we exclude Nos. 14 to 18 grown under conditions of very abnormal exhaustion of certain mineral constituents, Nos. 1 to 13, 19 to 24, 27 and 28 are all priced at 32s. per quarter; Nos. 25 and 26 at 6d. more, namely, 32s. 6d.; and Nos. 29 to 33 at 6d. less, that is, 31s. 6d. This is the case notwithstanding there was the greatest possible variety of manuring, and a range in the amounts of produce among these 28 plots of from 9½ to 40½ bushels per acre. It is clear, therefore, that, excepting under certain abnormal conditions, the character of the manuring has very little direct influence on the

TABLE I.—*Produce and Value of the Wheat Crop of 1889, on Broad-balk Field Experimental Plots.*

Serial No.	Field Plots	Mineral Manures				Nitrogenous Manures	Dressed Wheat per acre	Weight per bushel	Value per quarter	Value of the Wheat per acre	
		Sulphate Potass	Sulphate Soda	Sulphate Magnesia	Superphosphate Lime						
1	2 land 1	14 tons farmyard manure since 1855					bush.	lb.	s.	d.	£ s. d.
2	2 land 2	14 tons farmyard manure since 1844					31½	59·2	32	0	5 13 7
3	3	Unmanured since 1844					40½	59·3	32	0	7 12 6
4	4						12½	59·8	32	0	2 8 11
5	5a	lbs.	lbs.	lbs.	cwt.	—	12½	60·	32	0	2 8 0
6	5b	200	100	100	3½	—	14½	60·5	32	0	2 15 5
7	6a	—	—	—	—	—	15½	60·2	32	0	2 19 7
8	6b	200	100	100	3½	200 Ammonia salts	22½	60·5	32	0	4 6 11
9	7a	—	—	—	—	—	23½	60·1	32	0	4 8 5
10	7b	200	100	100	3½	400 Ammonia salts	30½	60·3	32	0	5 18 7
11	8a	—	—	—	—	—	30½	60·2	32	0	5 16 7
12	8b	200	100	100	3½	600 Ammonia salts	35½	59·2	32	0	6 7 2
13	9a	—	—	—	—	—	35½	59·4	32	0	6 13 5
14	9b	200	100	100	3½	275 Nitrate of soda	26½	59·5	32	0	4 19 2
15	10a	—	—	—	—	275 Nitrate of soda	12½	55·6	29	0	2 0 0
16	10b	—	—	—	—	400 Ammonia salts	11½	57·0	28	6	1 17 9
17	11a	—	—	—	—	—	12½	55·3	28	0	1 19 1
18	11b	—	—	—	3½	400 Ammonia salts	16½	56·8	28	6	2 11 7
19	12a	—	—	—	—	—	16½	56·1	28	6	2 11 1
20	12b	—	366½	—	3½	400 Ammonia salts	24½	58·2	32	0	3 18 9
21	13a	—	—	—	—	—	23½	59·2	32	0	4 9 3
22	13b	200	—	—	3½	400 Ammonia salts	25	59·9	32	0	4 15 0
23	14a	—	—	—	—	—	27	60·5	32	0	5 3 8
24	14b	—	—	250	3½	400 Ammonia salts	28½	59·2	32	0	4 15 10
25	15a	—	—	—	—	—	24½	59·2	32	0	4 10 2
26	15b	200	100	100	3½	400 Ammonia salts (autumn)	23½	61·1	31	6	5 10 11
27	16a	—	—	—	—	—	23½	60·9	32	6	5 0 1
28	16b	200	100	100	3½	550 Nitrate of soda	29	60·1	32	0	5 10 7
29	17a	—	—	—	—	—	29	59·1	32	0	5 8 10
30	17b	200	100	100	3½	—	11	59·0	31	6	2 0 7
31	18a	—	—	—	—	—	0½	59·0	31	6	1 15 3
32	18b	—	—	—	—	400 Ammonia salts	22	60·1	31	6	4 2 4
33	10	1889 lb. Rape Cake in Autumn					24½	59·7	31	6	4 13 3
							22½	57·1	31	6	4 4 6

quality and value of the grain. The truth is, that there is very much more difference in the quality of grain grown by the same manure in different seasons, than by all the variety of manures used in the experimental plots, in the same season. In fact, excluding Nos. 14 to 18, the differences in weight per bushel and in value are, in all other cases, explained by comparatively slight differences in condition, dependent on the adaptation of the climatic conditions during the ripening and harvest periods to the slightly varying stage of growth and maturity at the time, under the influence of the very various manuring."

By taking the mean value of the wheat produced on the two half-plots which have the same manures, and arranging the whole plots in the order of the market value of their produce, we get the results shown in Table II., page 435.

In the year 1889, the top half of each plot was sown with only half the usual number of rows of wheat, the full number being sown in the bottom half. On the top half the rows were 15 inches apart or 9 to the land, and in the bottom half they were 7½ inches

TABLE II.—*The Plots of Broadbalk Field arranged according to the Market Value of the Wheat.*

Value of the Wheat per acre	Mineral Manures				Nitrogenous Manures
	Sulphate of Potass	Sulphate of Soda	Sulphate of Magnesia	Super-phosphate of Lime	
£ s. d.	lb.	lb.	lb.	cwt.	
7 12 6					Fourteen tons farmyard manure since 1844
6 10 3	200	100	100	3½	600 lb. ammonia salts
5 17 7	200	100	100	3½	400 lb. ammonia salts
5 13 7					Fourteen tons farmyard manure since 1855
5 9 8	200	100	100	3½	550 lb. nitrate of soda
5 5 6	200	100	100	3½	400 lb. ammonia salts
4 19 4	200	—	—	3½	400 lb. ammonia salts
4 19 2	200	100	100	3½	275 lb. nitrate of soda
4 13 10	—	—	280	—	400 lb. ammonia salts
4 7 11	—	—	—	—	400 lb. ammonia salts ¹
4 7 8	200	100	100	3½	200 lb. ammonia salts
4 4 3					1889 lb. rape-cake applied in autumn
4 4 0	—	366½	—	3½	400 lb. ammonia salts
2 18 0	200	100	100	3½	None
2 11 4	—	—	—	3½	400 lb. ammonia salts
2 7 5					Unmanured since 1844
2 0 9	—	—	—	—	275 lb. nitrate of soda
1 18 5	—	—	—	—	400 lb. ammonia salts
1 17 11	200	100	100	3½	None ²

¹ Mineral manures were put in for the crop of the previous year.² Ammonia salts were supplied for the crop of the previous year.

apart or 18 to the land. This thin sowing was a temporary expedient to clean the ground, which had become very foul under the continuous cropping with thick sowing. It involved very much more risk of damage from hoeing and trampling than the usual thick sowing, and very much more on some plots than on others, as some were more foul than others. The valuer made a careful comparison

TABLE III.—*Quantity of Dressed Grain per Acre on the Thick and Thin Sown Portions of the Plots.*

Serial No.	Thick Sown	Thin Sown	Serial No.	Thick Sown	Thin Sown	Serial No.	Thick Sown	Thin Sown
	bushels	bushels		bushels	bushels		bushels	bushels
1	31½	28	12	35½	27½	23	25½	14½
2	40½	37½	13	26½	28½	24	24	12½
3	12½	9½	14	12½	5	25	28½	20½
4	12½	11½	15	11½	3½	26	25½	18½
5	14½	15½	16	12½	5½	27	29	24½
6	15½	16½	17	16½	16½	28	29	23
7	22½	23½	18	16½	16½	29	11	7½
8	23½	24½	19	24½	16½	30	9½	7½
9	30½	31½	20	23½	16½	31	22	22
10	30½	29½	21	25	23½	32	24½	23½
11	35½	29½	22	27	20½	33	22½	20½

436 *Market Value of Wheat and Barley Grown in 1889.*

of the samples from the thin and thick sown portions of the plots, with the general result that the quality of the grain was somewhat better on the thick sown portions. The quantity produced per acre was, in several cases, larger in the thin sown than in the thick sown. Dr. Gilbert in considering these results says, "The question arises how far this is due to the thin crops being much cleaner from the extra hoeing, and being much less laid, or how far to the fewer plants having a better command of the resources of the soil."

TABLE IV.—*Produce and Value of the Barley Crop of 1889 on Hoosfield Experimental Plots.*

Serial No.	Mineral Manures					Nitrogenous Manures	Dressed Barley per acre	Weight per bushel	Value per quarter	Value of the Barley per acre	
	Sulphate Potash	Sulphate Soda	Sulphate Magnesia	Superphosphate Lime	Silicate Soda						
1	Unmanured.					lb.	bush.	lb.	s. d.	£ s. d.	
2	lb.	lb.	lb.	cwt.	lb.	—	11½	51·3	34 0	2 7 10	
3	200	100	100	3½	—	—	20	52·6	38 0	4 15 0	
4	200	100	100	3½	—	—	9	51·5	33 0	1 17 1	
5	—	—	—	—	—	200 Ammonia salts	17½	52·7	38 0	3 17 7	
6	—	—	—	—	—	" " "	22½	51·9	29 6	4 2 11	
7	200	100	100	3½	—	" " "	35½	51·5	29 6	6 10 0	
8	200	100	100	3½	—	" " "	19½	53·5	30 0	3 8 1	
9	—	—	—	—	—	275 Nitrate soda	35½	51·9	30 0	6 14 0	
10	—	—	—	—	—	" " "	25½	52·9	30 0	4 14 8	
11	200	100	100	—	—	" " "	41½	51·4	31 0	8 0 9	
12	200	100	100	3½	—	" " "	24½	52·8	31 0	4 14 11	
13	—	—	—	—	400	" " "	36	52·3	32 0	7 9 0	
14	—	—	—	—	400	" " "	29	53·1	32 0	5 15 9	
15	200	100	100	—	400	" " "	42½	52·1	31 0	7 18 0	
16	200	100	100	3½	400	" " "	30	53·3	30 0	5 12 6	
17	—	—	—	—	—	1,000 Rape-cake	37½	53·2	33 0	7 13 8	
18	—	—	—	—	—	" " "	30½	51·6	32 0	6 3 6	
19	200	100	100	—	—	" " "	33½	52·0	32 0	6 7 3	
20	200	100	100	3½	—	" " "	28½	52·1	32 0	5 7 0	
21	14 tons farmyard manure 1852-71.					Unmanured since	30½	53·1	33 0	6 4 9	
22	14 tons farmyard manure since 1852					" " "	22½	53·1	32 0	4 9 0	
							41½	53·3	30 0	7 16 7	

TABLE V.—*The Barley of Hoosfield arranged according to the Value of the Produce per Acre and the kind of Manures used.*

—	Without Nitrogenous Manures	200 lb. Ammonia salts.	275 lb. Nitrate of Soda	275 lb. Nitrate Soda and 400 lb. Silicate Soda	1,000 lb. Rape-Cake	Average Value
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Superphosphate of lime . . .	4 15 0	6 10 0	8 0 9	7 18 0	6 7 3	5 15 5
Full minerals and superphosphate of lime .	3 17 7	6 14 0	7 9 0	7 13 8	6 4 9	5 12 3
Nitrogenous manures only .	—	4 2 11	4 14 8	5 15 9	6 3 6	5 4 2
Full minerals .	1 17 1	3 8 1	4 14 11	5 12 6	5 7 0	3 16 6
Average value	3 9 10	5 3 9	6 4 10	6 14 11	6 0 7	—

B. BARLEY.

The experiments on the growth of barley have been carried on in the Hoosfield since 1852, so that the crop of 1889 was the thirty-seventh in succession. Some modifications of the manures were made in the earlier years of the experiments, but since 1868 the manures recorded in the tables have been annually applied.

The average market price of home-grown barley on October 25 (the day on which the adjudication of the samples by the valuer took place) was 30s. 11d. per quarter.

From Table V., page 436, it appears that the most valuable crop was produced by the use of nitrate of soda with superphosphate of lime, and the highest average was obtained from the plots to which the lime, silicate as well as the nitrate of soda was applied.

BOUNDARY FENCES.

A note upon a case decided in the County Court of Derbyshire held at Bakewell by His Honour Judge Barber, Q.C.¹

So much misapprehension exists on the subject of the obligation to repair boundary fences, and on the question, which often arises in consequence, whether the owner of cattle which stray into a neighbour's premises is or is not liable for the damage thereby occasioned, that a note of the following case can hardly fail to be useful. It may be premised that Judge Barber, who decided the case, practised while at the Bar on the Chancery side, and he had for many years a great reputation as a conveyancer and real property lawyer.

The plaintiff was at the date of the action, and had been for some seven or eight years previously, the tenant or occupier of a field of grazing land known as Fisher's Piece. On the north side of that field was a stone wall, which separated it from the adjoining field, also used for grazing purposes, and known as Poor's Piece, in the parish of Castleton. The wall was in fact the boundary at this point between the parish of Castleton and part of the township of Bradwell, which is part of the parish of Peak Forest. The wall was of the dry masonry so well known in the district, and was of a height varying from about four to five feet.

The plaintiff claimed that his landlord was the owner of the wall, and that it was included in his tenancy; and this was conceded by the defendant. It was proved at the trial that in places the wall

¹ Fletcher v. Howe. Reported in the *Law Journal* for January 25, 1890, p. 64.

was much out of repair, with several large gaps in it. The defendant was tenant and occupier of Poor's Piece, which he used for grazing purposes. The plaintiff's case was that on various occasions the defendant's sheep, occasionally from twenty to thirty at a time, got into Fisher's Piece through the gaps in the north wall and did damage, for which he claimed 10*l*. It was proved that the defendant's sheep from time to time during the summer of 1888 made incursions into Fisher's Piece, and that they did some damage, and the question for the Court was whether the plaintiff was entitled to recover under the circumstances of the case, the wall being admittedly his, and he not having kept it in repair.

At the trial it was contended on behalf of the plaintiff that although the plaintiff or his landlord was undoubtedly the owner of the wall, and that the plaintiff had not repaired it himself or allowed the defendant to do so, he was nevertheless entitled to recover damages from the defendant for the trespass committed by his sheep; and that whether the trespass was or was not in any degree attributable to his own negligence was for the purposes of the action wholly immaterial. For the defendant it was urged, that if there had been no gaps or weak places in the wall, the defendant's sheep would not have got through and done the damage; that it was the duty of the plaintiff, as between himself and the defendant, to keep his own wall in repair; and that, as he would neither repair it himself nor allow the defendant to do so, he could not sue the defendant for the consequences of a trespass which he himself might have prevented by the exercise of a little reasonable care.

"We have here," said the learned judge, "the question distinctly raised, On whom does the law cast the obligation of preventing cattle or sheep from straying? Is the owner of the cattle or sheep bound to keep them within the limits of his own land, or is the owner of the adjoining land bound to protect himself against the possible incursions of his neighbour's cattle? There is, I need hardly observe, no statutory obligation in this case, such as is imposed on railway companies, who are bound by statute to make and maintain sufficient fences, not merely for the purpose of separating the land taken for the use of the railway from the adjoining lands not taken, but also for protecting such lands from trespass or the cattle of the owners or occupiers thereof from straying thereout by reason of the railway; nor is this the case of a man bringing something noxious or dangerous on to his land, or, as Lord Cairns put it, 'using his land in a non-natural manner'; the defendant here is using his land in a proper, legitimate, and usual manner. The law is very ancient and well settled; it is expressed in the old maxim, '*Sic utere tuo ut alienum non ledas*,' and almost the earliest, if not the earliest cases, in which this maxim was applied, were cases of cattle trespass. Lord Hale states that where one keeps a beast, knowing that its nature or habits are such that the natural consequence of his being loose is that he will harm men, the owner must at his peril keep him safe from doing hurt'; for, though he

use his diligence to keep him shut up, if he escape and do harm, the owner is liable to answer in damages.

"As Mr. Justice (afterwards Lord) Blackburn said in the case of *Fletcher v. Rylands*, 'The person whose grass or corn is eaten down by the escaping cattle of his neighbour is damnified without any fault of his own, and it seems but reasonable and just that his neighbour, who has brought something on to his own property which was not naturally there, harmless to others so long as it is confined to his own property, but which he knows to be mischievous if it gets on his neighbour's, should be obliged to make good the damage which ensues if he does not succeed in confining it to his own property.' This, then," continued his Honour, "being the general rule of law, is its operation at all qualified or affected by the fact of the owner of the land on which the trespass is committed having himself for his own purposes built a fence wall, which, if kept in repair, would protect him against his neighbour's sheep? In the absence of any contract between the adjoining owners as to the maintenance of the wall (of which in the present case there is not the slightest evidence), it is obvious that the owner of the wall, who built it for his own convenience, might of his own free will take it down and remove it, just as he might any other building on his land, unless the adjoining owner had in the meantime acquired the right to have the wall maintained for his own protection; and this brings me to the really difficult question in this case—viz., Can the defendants successfully urge by way of defence to the undoubted trespass that they had a prescriptive right to have the wall maintained, and that the trespass is due to the plaintiff not having kept the wall in repair? It is well settled that an owner of land may be bound by prescription to maintain and repair a fence for the benefit of the owner of the adjoining land, who may have a corresponding right to have the fence so maintained. Whether such a right has been acquired depends of course upon the evidence adduced in each particular case.

"What are the facts here? The wall is admittedly an old one, probably built at the time when the waste lands of Castleton and Bradwell were inclosed at the end of the last or the beginning of the present century. At the trial I asked for the Inclosure Awards, or extracts from them, because I thought it probable that the obligation to make and maintain this north wall would be thrown on the allottee of Fisher's Piece, especially as it formed the boundary line between this piece and the adjoining parish of Castleton. I have not been supplied with this information, and, whatever the probabilities may be, I cannot of course assume as a fact proved that the obligation to maintain this wall was thrown by the award on the owner of Fisher's Piece. But, at any rate, there is this solid fact to rest upon. The wall unquestionably belonged to the owner of Fisher's Piece; and it was important, if not absolutely necessary, that it should be maintained, not merely as separating the properties of two private owners, but as the boundary between two adjoining parishes. The only person who could properly repair the wall was the owner of

Fisher's Piece ; any other person attempting to do so would be a trespasser. *Prima facie*, therefore, the owner of Fisher's Piece is the proper person to repair the wall, if there is any obligation to maintain it."

After stating that the evidence at the trial proved that the wall had been repaired by the tenants of Fisher's Piece, is Honour continued, "From that evidence and the other facts of the case I come to the conclusion that the owner of that field or his tenant is bound to maintain this wall for the benefit, not only of himself, but also of his adjoining neighbour, and that the plaintiff by not keeping it in repair or repairing it when it was out of repair committed a breach of his duty. What, then, is the result? It was many years ago decided that where a man had distrained damage feasant cattle that had escaped from a close through a defect of a fence, which he himself ought to have repaired, and ultimately strayed into his close, he was wrong, the trespass being the natural consequences of his own neglect of duty. The principle of that decision governs the present case; if the plaintiff, as I hold it was his duty to do, had kept this fence in repair, the trespass would not have happened. There must therefore be judgment for the defendant. But I would add a word in addition to prevent any misapprehension as to the meaning and effect of my judgment. While I hold that the defendant has established a prescriptive right to have the wall maintained in repair, I do not think that he can claim to have it made higher so as to be a more effectual barrier. One of the witnesses said he did not think it was a turnable fence, but there was no evidence to show that the sheep jumped over the low places of the wall, only that they got through the gaps. If after the wall is repaired the defendant's sheep jump over the low places into the plaintiff's field, he will, according to my view, be liable for any trespass which the sheep commit. It is not for me to advise the defendant, but it is worth his consideration, if any part of the wall is a doubtful barrier, whether for his own protection he should not put up a wire fence on his own land."

A writer in the *Law Journal* thus tersely and truthfully comments on this case: "The lesson which the Judge reads to the Agricultural mind in the district over which he presides is that an occupier of land, if he does not fence for himself, must take his chance of his neighbour's cattle straying on his land, unless he can show by a long course of practice that the occupier of the neighbouring land has not only repaired the fence but has repaired for his neighbour's advantage as well as his own."

S. B. L. DRUCE.

THE CULTIVATION OF SUGAR-BEET.

THE proposal to cultivate sugar-beet in the British Isles is by no means new. The subject was before the public more than ten years ago, when, in 1879, a Select Committee of the House of Commons was appointed to inquire into the effect produced upon the home and colonial sugar industries of this country by what is known as the bounty system in those Continental countries which manufacture sugar for exportation. In giving evidence before the Committee, Mr. James Duncan was asked if he could offer any explanation of the fact that the growth of beetroot was practically confined to the Continent; and whether he considered no part of this country was adapted to the growth of beetroot. Mr. Duncan's reply was that it was so adapted, but that the disadvantage of growing was owing to the bounty system, foreign sugar having a bounty which might be taken to be on the average 2*l.* a ton (in France the bounty is now 5*l.*), and which acted as a check upon the growth of sugar in England. In answer to further questions, Mr. Duncan stated that the bounty rendered it practically impossible to grow any beetroot in this country, though it could be raised in the east of England of quite as good quality as, if not better than, in France.

Mr. George Martineau, in his evidence before the same Committee, said that he had given a very considerable amount of attention to the subject of the growth of beetroot in England. Asked as to the relative richness of roots grown in England as compared with those of foreign countries, Mr. Martineau stated that Dr. Voelckér, chemist to the Royal Agricultural Society, had found 12 per cent. of sugar in roots from Suffolk; 12½ and 13 per cent. in roots from Berkshire; 11½ per cent. in roots from Surrey; 10½ to 13½ per cent. in roots from Yorkshire; and 10, 12, and 13, up to 15 per cent. in roots from Kilkenny. This was in 1870, since when Mr. Martineau himself has taken a considerable amount of trouble in the matter, and has grown beetroots both in Lincolnshire and the Isle of Thanet; and, as far as the latter are concerned, has in his own laboratory found 15 per cent. of sugar—a degree of richness in which England, in his opinion, can certainly compete with France, where the average is not more than 10½ per cent.

The results of experiments in England and Ireland carried out last year under the direction of Dr. G. Schack-Sommer, 323, Vauxhall Road, Liverpool, would appear to have again brought the idea of beet cultivation within the possibility of profitable realisation. The trials were conducted on the farms of Mr. John Gibbons, Dunbabin Farm, Wavertree, Liverpool (the Marquis of Salisbury's estate), and Mr. John Ennis, Springwood, Ballymitty, co. Wexford, four varieties of the best kinds of seed having been obtained from Dr. C. Scheibler, the eminent sugar chemist of Berlin. As regards choice of soil and manure, however, no special care was exercised, and the management of the crop during growth was left in quite inexperienced hands.

With reference to this last-named point, it is of interest to note that M. Basset, in his *Guide pratique du Fabricant de Sucre*, states that soils rich in mineral salts are not adapted to the cultivation of beet intended for the sugar factory. Beet easily absorbs saline matters, and alkaline salts constitute one of the greatest obstacles to sugar extraction. In the cultivation of beet in France, M. de Vilmorin recommends a first ploughing in November to break up the land to a depth of 8 or 10 inches, followed by a subsoil ploughing to a similar depth, so that the ground may be thoroughly stirred to a depth of at least 15 inches. Left rough through the winter, the land is twice ploughed in spring, in February and April, and is finally prepared for sowing by harrowing and rolling. Though special drills may be used, yet any drill that will deliver the seed regularly and in sufficient quantity will suit the purpose. The last week of April or early half of May is regarded as the best time for sowing; the temperature is then about 50° to 60° Fahr., which is the most favourable to rapid and safe germination. As with the closely allied mangel, so with beet, the germinating capacity of the seed is facilitated by immersion in water at a temperature of 120° Fahr. The first hoeing takes place as soon as the young leaves are distinguishable in the drill-rows, this being performed by either horse or hand labour. At this period, too, it is usual to dress with nitrate of soda. A fortnight later the plants are thinned out to 8 or 9 inches apart. About three more hoeings or cultivations should be effected by the beginning of July, after which no further care should be needed except the removal of any seed-stalks that may run up. From mid-September to mid-October is the period for lifting the roots; but they should not be allowed to remain in the ground long enough to get frosted.

From details communicated by Dr. Schack-Sommer to the Society of Chemical Industry it appears that wet or swampy ground is quite unsuited to beet-growing, the most suitable soil being a well-drained loam containing lime. A good artificial manure is one including 1 part of nitrogen to 2 parts of phosphoric acid as superphosphate; in Germany as much as 2*l.* to 3*l.* per acre are spent on artificial fertilisers. A suitable proportion is about 160 lb. nitrate and 320 lb. superphosphate, or 320 lb. Peruvian guano and 160 lb. superphosphate, per acre. Though at Wavertree and at Ballymitty the usual precautions in beetroot cultivation were neglected, the crop not even being properly thinned, the analyses of the roots proved them to be as rich in sugar as those of German growth. Comparison with German roots was rendered possible through the circumstance that Mr. F. O. Licht, of Magdeburg, publishes during the summer months a *résumé* of the results obtained in his analyses of freshly-drawn beetroots. On the same days as those selected by Mr. Licht, Dr. Schack-Sommer had beetroots drawn from the earth both in Ireland and Lancashire, and analysed them in his laboratory. The results are shown in the table on the opposite page.

The most important figures in these tables are those showing the quantity of sugar in 100 parts, the English and Irish roots com-

	Mr. F. O. Licht, Magdeburg	WAVERTREE. Grown at Dunbabin (Marquis of Salisbury's Estate), Lancashire, by Mr. John Gibbons				IRELAND. Grown at Ballymitty, near Wexford, by Mr. John Ennis			
Date of experiment	Oct. 10, 1889	October 10				October 10			
		Seed No. 1	Seed No. 2	Seed No. 3	Seed No. 4	Seed No. 1	Seed No. 2	Seed No. 3	Seed No. 4
Number of beetroots drawn for experiment.	112	10	10	10	10	10	10	10	10
Average weight with leaves in grammes	900	675	953	967	1268	1079	1118	1177	1077
Average weight without leaves in grammes	540	246	304	404	429	506	469	460	479
Largest root with leaves in grammes	1670	800	1260	1330	2215	1440	2040	1500	1650
Largest root without leaves in grammes	1205	370	660	670	760	690	720	640	710
Smallest root with leaves in grammes	490	400	590	510	770	780	830	780	740
Smallest root without leaves in grammes	295	130	210	200	310	380	320	310	330
Specific gravity of juice . . .	1.0806	1.0799	1.0799	1.0784	1.0793	1.0867	1.0833	1.0821	1.0888
Degrees by Brix saccharometer	19.4	18.7	18.7	18.3	18.4	19.9	19.8	19.6	19.9
Quantity of sugar in 100 parts	16.58	16.5	17.0	16.7	16.4	18.2	17.5	17.2	18.8
" " non-sugar "	2.82	2.2	1.7	1.6	2.0	1.7	2.3	2.4	1.1
Quotient of purity "	85.5	88.2	90.9	91.2	89.1	91.5	88.4	87.8	94.6

1 kilogramme (1,000 grammes) equals 2.2 lb. avoirdupois.

paring favourably with the German ones. The saccharometer, or sugar-measuring instrument, employed was that of Brix, which is supposed to show what quantity of sugar there is in the juice, whilst the quantity indicated by the polariscope is real sugar; the figures under the head of "non-sugar" are the differences between these. The main object of analysis is to discover how much per cent. of pure sugar it is possible to extract from 100 parts of the solids of the juice, and the higher this percentage is, of course the better the beetroot. To calculate this, the saccharometer of Brix is used to show the dry substance of the juice, and then a calculation is made as to how much is sugar. If, for instance, a juice has 12 per cent. of sugar and shows 15 per cent. on the saccharometer, the result is 80 per cent. of sugar to 100 parts of dry substance.

The yield of crop was only noted at Wavertree, where it averaged 42 tons 19 cwt. per acre; equivalent, say, to 15 tons of clean roots, a very heavy crop being given by the variety of Dippe's seed known as Gebrüder Dippe's verbesserte Zuckerreiche kleine Wanzelbohnen Elitezüchtung.

There is no foundation for the idea that beetroot is an exhausting crop. Before the Select Committee, in 1879, Mr. Martin quoted Mr. John Algernon Clarke, Secretary to the Central Chamber of Agriculture, and Dr. Voelcker, chemist to the Royal Agricultural Society, to the effect that it is not an exhausting crop, and that it is one very favourable to the growth of wheat, the deep cultivation necessary to grow beetroot increasing the yield per acre of cereals and other crops.

The following examples taken from *Die Zuckerrübe und ihre rationelle Cultur* by Dr. C. J. Eisbein, bear upon this point.

On the estate of Groena, in the Dukedom of Anhalt, which comprises about 700 or 800 acres of fertile land, they did not plant any beetroot before 1837, and then up to 1853 only a few acres for trial. In 1853, however, they began to plant about 150 acres every year, and in 1856 the results proved conclusively that they had got as much corn as they had formerly done when the whole area of the estate was devoted to its cultivation. On another estate, that of Ossnarsleben, near Bernburg, which comprised about 1,000 acres of fertile soil, they generally had a little more than half of the area in grain. They found, after introducing the cultivation of beetroot, that they had an increase of about 2 per cent. in the grain crop. In France, in the Arrondissement of Valenciennes, not only was the cereal crop increased by the introduction of beetroot, but they were able to feed 11,500 head of cattle instead of 700. The conclusion to which these facts point is that beetroot, so far from being an exhausting crop, enriches the soil if it is grown with a due regard to rotation. It is claimed that not only is it a paying crop in itself, apart from the question of the value of its fibre as food for cattle, but that it improves the condition of the soil for wheat or other cereal production.

As to the frequency with which the sugar-beet crop should occupy the land, the best authorities consider it should come once in six or eight years. Dr. Eisbein, who is Professor of Agriculture at Heddesdorf, near Neuwied, recommends the following rotation :—First year, beetroot dressed with stable manure ; second year, oats or barley ; third year, clover and grass ; fourth year, wheat ; fifth year, peas, beans, or other leguminous plants or potatoes, dunged with stable manure ; and sixth year, rye. An alternative succession would be : First year, beetroot with stable manure ; second year, barley or spring wheat ; third year, clover or grass ; fourth year, wheat ; fifth year, potatoes ; sixth year, oats ; seventh year, leguminous plants such as peas, beans, &c., with stable manure ; and eighth year, rye.

It is important to recognise that, in the extraction of sugar from the beet, all that is taken away from the root is the carbonaceous material which the latter obtains from the atmosphere. Practically the whole of the ingredients which the plant takes from the soil, except a small percentage of salts, remain in the refuse after extraction of the sugar, and are therefore directly available for the feeding of stock. Another point of interest is that the rather long interval between two beet crops in the rotation is by no means due to the circumstance that land could not profitably carry beetroot much more frequently, but is owing to the fact that it is liable to the attack of certain nematode parasites which would be unduly encouraged were the crop repeated too often.

An indispensable adjunct to the profitable cultivation of sugar-beet would obviously be the convenient proximity of a factory to which the roots could be sent. On the Continent generally, where beetroot is grown, a number of farmers in each district club together and build a factory, each farmer undertaking to deliver to

the factory a certain weight of beetroot during the season. The factories are run on this principle, and after the owners' contract quantity is worked up they buy further quantities in the open market if they deem it advisable, and by this system each factory is secured a minimum quantity at a stipulated price each season. It is estimated that the capital required to establish in England or Ireland a single factory capable of dealing with 50 tons of roots per day would be about 8,000*l.* or 10,000*l.*

Attempts have been made to establish such factories in this country, and they appear to have been unsuccessful chiefly for the reason that the promoters lost sight of the most important necessity of securing the co-operation of a sufficient number of farmers who would undertake the growth for a period of years of an adequate area of beetroot. The elaborate experiments at Lavenham were further handicapped through local difficulties in connection with the disposal of refuse water.

An instructive table published in the *Deutsche Zuckerindustrie* shows for the German joint-stock beet-sugar companies, for the year 1887-88, the name of each factory, the quantity of beets worked up, the price of beets, the amount written off capital account, and the profit or loss on the year's working. As many as 176 factories are enumerated, the individual capitals of which range from 7,500*l.* to 300,000*l.* Only seven factories show a loss on the year's working, the greatest loss being 3,368*l.* Profits are shown by 160 companies, the highest profit being 36,000*l.* on a capital of 236,000*l.* Nine factories show neither profit nor loss, the balance being written off.

The following extract is taken from a letter recently addressed to Dr. Voelcker by Mr. James Duncan, whose name was mentioned at the outset :—

"In the year 1868 or 1869, I erected a sugar factory in Suffolk. This was done after careful experiments all over England, Ireland, and Scotland. I found the east of Ireland and the east of England gave the best results, the west of England the worst, the midland counties very fair. Sugar-beet wants a warm wet summer and a cool dry autumn, also a cold winter to conserve the roots. In the west of England the beet continues to grow in the autumn, and does not ripen; dry frosty weather ripens the root; mild moist weather keeps the leaves growing.

"The reason why sugar-beet is not grown in this country is on account of the sugar bounty system. Germany, Austria, France, Belgium, and Holland have found this industry to be very profitable, employing much labour, introducing into farming a superior class of men, and requiring a large number of cattle to consume the pulp. The corn-crops, by the increase of manure and the very careful scientific culture, have been greatly increased.

"Sir John Lawes and Dr. Gilbert carried out a lot of experiments on the growth of sugar-beet; but since they stopped the experiments, the Germans have very largely increased the percentage of sugar in the roots; twenty-one per cent. is now quite common.

"The cultivation of roots in England is not understood. Nitrate of soda is the sheet-anchor of beet cultivation. For dairy cattle sugar-beet gives capital results."

It may be added that the experiments on the cultivation of sugar-beet at Rothamsted were conducted during the years 1871 to 1875. Since that time, sugar-beet seed—and the quality of the seed is of the greatest importance—has been much improved by selection.

The subjoined statement, expressed in English equivalents, is given as representing the cost and result of beet-cultivation in Germany:—

COST OF GROWING, &c.			AMOUNT REALISED.		
	£	d		£	s. d.
Topping stubble, 6s.; twice harrowing, 3s.	0	9	0	33,070 lb. beetroot at	
Deep ploughing with four horses or steam	1	2	0	1s. 1d. per cwt.	13 19 10
Twice harrowing in spring	0	2	0	35 per cent. residue for	
Drilling, harrowing, drilling, and rolling	0	12	0	feeding cattle, 11,574 lb.,	
Artificial manure, 2l. 10s.; hoeing and weeding, 2s.	2	12	0	at 3½d. per cwt.	1 10 2
Beetroot seed	0	10	6	8,250 lb. leaves and roots,	
Horse-hoed or drilled three times	0	6	0	at 3d. per cwt.	0 18 6
Hoed by hand twice, 9s.; thinning, 5s.	0	14	0		18 8 6
Lifting roots and trimming and washing	1	0	0	Expense of working, or all	
Sending roots to works, 1l. 16s.; making silos, 1s. 6d.	1	17	6	and every expense in-	
Rent, 2l. 10s.; ground dues and taxes, 18s.	3	8	0	cluded	12 13 0
	12	13	0	Nett profit per acre to farmer	5 15 6

* These it may be much lower in England

With the foregoing it is interesting to compare the estimate on the opposite page as to the cost of growing sugar-beet in England. The figures are those of Mr. J. A. Clarke, but as they refer to a period of more than ten years ago, several of the items might now be reduced.

It might be suggested that last year was an exceptionally favourable season for the growth of beet; but so far as the general saccharine yield may be taken as a test, it was not so. As a matter of fact, the saccharine yield in 1889 in Germany was by no means abnormal; nor was it equal to the highest of recent years, since the saccharine yield in 1885 was over 13 per cent., whilst in 1889 the average was under 12 per cent. The weight of roots per acre, however, in 1889 was much heavier than in 1888—a circumstance which may be attributed to the extremely favourable conditions under which the beet was sown in 1889. The average yield of sugar

last year, in Germany and Western Europe, as calculated from Mr. Licht's figures, may be put at 9,548 lb. per acre.

MR. JOHN ALGERNON CLARKE'S TABLE.

	£	s.	d.
Rent, tithe, taxes, and other common charges	3	0	0
Clearing and forking wheat stubble	0	1	6
Carting 10 loads farmyard manure, 5s. 6d.; spreading, 1s. 6d.	0	7	0
Ploughing 10 in. deep and subsoiling 6 in. more	1	2	0
Cultivating in spring, 2s. 6d.; harrowing, and rolling, 5s.	0	7	6
7 cwt. superphosphate, 2l. 2s.; preparing and sowing, 3s.	2	5	0
Seed (12 lb.)	0	7	6
Drilling and crushing or rolling, 2s.; hoeing and singling, 15s.	0	17	0
Taking up, topping, and putting in heaps	0	16	0
Carting, graving, and earthing down	0	14	0
	9	17	6
Add:—Delivery to factory 20 tons 2½ miles, at 6d. per ton per mile for haulage, and 3d. per ton for working	1	10	0
	11	7	6
Supposed value of 10 loads fresh farmyard manure (say 4s.)	2	0	0
	£13	7	6

The feeding value of the refuse fibre or pulp of the root from which the juice has been removed is well known. This pulp is of the greatest importance to farmers who grow the root for manufacturers, for, just as oilcake is a valuable bye-product of seed-crushing, so there is not a better food for cattle than the beetroot pulp, which has from 10 to 12 per cent. of solids, which is as much as mangel generally possesses. The carts taking roots to the factory would carry pulp back. It is usually mixed with hay, chaff, oilcake, and maize.

The importance of cultivating sugar-beet as a source of sugar is fully recognised in the United States, where beet-cultivation is receiving increasing attention. Within the present year several of the State agricultural experiment stations have issued bulletins reporting progress in connection with the new industry. Last year's trials in Iowa were not encouraging in their results—a circumstance attributed to the inferior quality of the seed furnished by American seedsmen; the trials are being repeated this season with the best seed obtainable in Germany. Sugar-beets of good quality have been raised in Mercer County, Illinois. At the beet-sugar factory owned by Mr. Claus Spreckels and others, at Watsonville, California, the industry appears to be an established success. In Colorado the following precise instructions have been issued from the experiment station:—1. Prepare a deep and well-pulverised seed-bed. 2. Sow in drills about 18 to 20 inches apart, so as to admit of horse-culture between the rows, using from 7 lb. to 8 lb. of good seed per acre.

3. Irrigate judiciously, and keep clear of weeds. Cultivate thoroughly during their early growth. 4. When well up, thin, so that there shall be one thrifty plant every 6 or 8 inches (some say 10 or 12 inches), taking care not to injure the plants left standing. 5. In cultivation, take care to preserve the leaves, and to throw some earth to the plants each time. The portion of the beet which grows above ground does not contain much sugar. 6. Harvest when ripe, and preserve free from frost. As the results of analysis, the chemist to the Colorado station concludes:—1. That there is a greater percentage of ash present in beets grown on rich soil than in those grown on poor soil. 2. That the percentage of oxide of iron, of lime, and of phosphoric acid in the ash is greatest in beets from poor soil. 3. The specific gravity of the expressed juice of the beet is not a correct index to the percentage of sugar present, as various salts in solution, and often accidentally present, produce increased specific gravity when there is no corresponding increase of sugar. 4. An examination of the beet-root by horizontal sections shows a somewhat regular increase in sugar content from the top downward.

In Nebraska a systematic attempt was made in 1888, in and around Grand Island, to demonstrate experimentally that beets could be there raised of sufficient richness in sugar to warrant the investment of capital in a sugar-plant. The results were so satisfactory that last year the trials were repeated throughout the entire State, and, simultaneously, the Legislature of the State of Nebraska passed an Act the first section of which runs:—"That there shall be paid out of the State Treasury to any corporation, firm, or person engaged in the manufacture of sugar in this State from beets, sorghum, or other sugar-yielding canes or plants grown in Nebraska, a bounty of one cent ($\frac{1}{2}$ d.) per pound upon each and every pound of sugar so manufactured under the conditions and restrictions of this Act." In addition to this, Bills have been quite lately introduced into the United States Congress providing that a certain sum (as yet unspecified) shall be paid as a bounty, to the farmer or planter for every ton of two thousand pounds of sugar-beets raised in the United States, delivered to a factory, and manufactured into merchantable sugar; further, "that a bounty of eighty-five cents per one hundred pounds shall be paid by the Secretary of the Treasury upon all merchantable sugar made from sugar-beets in the United States, to be paid to the manufacturer thereof." Another Bill provides for an appropriation for the purchase of sugar-beet seed from abroad, and to exempt the importation of beet-sugar machinery, and such seed from duty. With circumstances like these operating in their favour, it is not surprising to learn that the development of the beet-sugar industry in the United States is now receiving the serious consideration of capitalists and scientists.

From a commercial point of view, the most serious obstacle that cultivators of sugar-beet in the British Isles would be called upon to encounter would be that arising from the artificial conditions created by foreign fiscal systems. In Germany alone the bounty paid last year on home-grown sugar-beet amounted to 885,000*l.*,

whilst in France it was upwards of 3,000,000/. The question as to the general suitability of our climate to the profitable growth of sugar-beet is one that can be settled by more extensive trials, and Dr. Schack-Sommer reports that this season the crop is being grown by upwards of fifty farmers in Ireland, in twenty different counties. The maintenance of dairy-stock, and of cattle generally, in association with the cultivation of sugar-beet may be regarded as a point in favour of the latter; nor is it likely that a more widespread activity in connection with a crop, the culture of which is based upon the soundest scientific principles, could exercise other than a salutary educational influence upon those concerned in its management. How readily the crop responds to improved methods of cultivation is shown by the circumstance that whilst in 1850-51 the officially declared yield of sugar in Germany was only 6.66 per cent. of the weight of the roots, in 1887-88 it had risen to 13.08 per cent. The more sanguine advocates of the cultivation of sugar-beet in England point, moreover, to the effect which the development of the sugar industry would have in increasing the demand for mechanical appliances both upon the farm and in the factory.

That there is a home market for beet-sugar, if it could be profitably produced in this country, appears to be evident from the fact that, according to the Board of Trade Returns, the total importation of sugar into the United Kingdom in 1889 amounted to 1,328,374 tons, of which 856,279 tons were beet-sugar, and 472,095 tons cane-sugar.

For the period of five months ended May 31 in each of the last three years our imports of refined beet-sugar have been as follows, the "other countries" comprising Holland, Belgium, the United States, and Russia:—

	1888	1889	1890
	Cwt.	Cwt.	Cwt.
From Germany . . .	1,303,261	2,073,177	2,127,564
„ France . . .	369,492	603,984	1,158,920
„ other countries . . .	810,404	1,119,351	821,068
Total . . .	2,483,157	3,796,512	4,107,552

During the first five months of the years named the United Kingdom has also imported from Germany and France the following quantities of unrefined beet-sugar:—

	1883	1889	1890
	Cwt.	Cwt.	Cwt.
From Germany . . .	1,585,829	2,904,619	3,054,124
„ France . . .	2,070	88,510	777,246

These figures indicate that Germany and, more especially, France are increasing their exports of beet-sugar to this country.

HARVESTING WHEAT IN WET SEASONS.

IN 1889 the production of wheat in France was estimated at 306,515,682 bushels, which represented more than one-fourth of the total estimated product (1,126,686,143 bushels) of Europe, and was more than four times as much as the total quantity (75,883,611 bushels) grown in the United Kingdom. Since, in Europe, France occupies the premier position as a wheat-producing country, the harvesting of wheat in wet seasons is a problem of high practical importance to the French cultivator. The lessons derived from the disastrous experiences of the wet summer of 1888, which are recorded by M. Grandeau in his *Études agronomiques*, deserve the attention of wheat-growers in this country.

The method, preferable to all others, of harvesting wheat in wet weather is that which has long been associated with the name of Mathieu de Dombasle. It consists in placing the wheat for a longer or shorter time in small stacks, before finally stacking it. As dry and elevated a site as possible is selected for each small stack. On this spot a sheaf is placed upright, its straws are then bent at about the middle, and the whole is flattened so that the ears are brought into contact with the lower extremities of the cut straw; this constitutes the base. Around and upon this other sheaves are arranged in such a manner that all the ears rest upon the central flattened sheaf, though none of them come in contact with the ground, and the straws extend fan-like from the centre to the circumference. Care is exercised in disposing the outer ends of the sheaves, which mark out a circle whose diameter is twice the length of the straw. Upon the bed or layer thus formed there is arranged another, then another, and so on, the outer wall of the cylindrical stack being kept vertical. When a height of a little over two feet has been attained, the workman commences to gradually diminish the diameter, by pushing the fresh sheaves a little forward, so that the ears of successive sheaves now begin to cross each other instead of, as heretofore, all radiating from a common centre. As a consequence of this, the centre begins to rise more rapidly than the circumference, and when the latter has attained the height it should reach, five feet, the summit will form a cone with rounded apex. The inclination of the sheaves at the top, whilst not enough to permit of their slipping off the underlying ones, should be sufficient to cause the rain to flow off freely. The structure is completed by placing on the top of the cone an inverted sheaf, the straw of which is so spread as to cover the upper surface of the small stack, and especially to protect it on the side facing the quarter from which rain usually comes. The ears of this inverted sheaf thus come to rest upon the cut ends of the straw of the uppermost layer of sheaves.

The value of such a small stack, or *meulon*, will necessarily depend upon the care and skill with which it is put together. In France four women carry sheaves to one man, who builds. Such a *meulon*, exposed to long-continued rains, will not be penetrated by moisture to a depth of more than two inches, and this rapidly dries

on the return of fine weather. After a heavy fall of rain, it is, however, desirable to inspect the *meulons*, and in any in which the rain has penetrated beneath the inverted sheaf which forms the cap, this latter should be lifted off as soon as the weather permits and exposed upon the ground in order to dry interiorly, whilst the sun and wind are drying the bared surface of the *meulon*. In the evening, or on the first sign of rain, the "cap" is returned to its place. Sometimes a gale will blow off the caps before these have had time to settle; they should be at once replaced by hand. A field of wheat harvested in this manner presents an appearance not unlike that of the "pikes" or "winds" of hay which are often left standing till late in the year in meadows in Ireland.

When grain is cut before it is ripe it may be put into *meulons*, provided that it is not wet either from rain or dew, and that the sheaves do not contain too much green herbage. In this latter case it is better to wait till the herbage has begun to dry. When there is a likelihood that corn crops may be laid by storms, or that wet warm weather may cause the still standing crop to germinate in the ear, premature cutting and preliminary stacking in *meulons* are strongly recommended, the ripening process being completed after cutting. Chemical analyses of the growing crop have served to indicate six well-defined periods or stages in the life-history of the wheat-plant:—1. From germination to spring-time; 2. From spring-time to the beginning of the formation of the ear; this period, lasting about four weeks from the end of April or the beginning of May, is characterised by a very considerable absorption of nutrient substances,—nitrogen, lime, potash, phosphoric acid. 3. A period of twenty-two or twenty-three days, during which the ear is undergoing development. 4. A period of nineteen or twenty days, from the emergence of the ear from its sheath to the end of the flowering period. 5. A period of thirteen days, from the time of flowering to the commencement of ripening. 6. A period of about twenty-two days to the completion of the ripening process. Denoting by 100 the total quantity of each of the mineral ingredients assimilated by wheat during the whole period of growth from germination to maturation, and also by 100 the weight of the organic substance built up during the life of the plant, the relations between the quantities of organic matter formed and of nutrient ingredients which are taken up are shown in the following table:—

Period of Growth	Days of Growth	Dry Matter	Organic Matter	Nitrogen	Mineral Matter	Potash	Lime	Magnesia	Phosphoric acid
1. From seeding time to spring.	about (?)	15.9	15.2	49.6	24.8	45.6	41.9	30.8	31.2
2. From 1 to beginning of formation of ear.	27	28.0	28.0	70.0	46.3	72.1	61.2	64.8	64.0
3. From 2 to the appearance of the ear.	23	66.6	65.3	80.5	85.3	98.9	88.9	81.8	83.6
4. From 3 to the end of flowering.	19	86.3	85.9	95.5	98.1	100.0	100.0	90.0	97.7
5. From 4 to the commencement of ripening.	13	100.0	100.0	100.0	100.0	97.3	97.3	91.4	96.5
6. From 5 to perfect maturation.	22	99.9	100.0	95.2	97.7	75.6	85.9	100.0	100.0

The significant figures in this table are those of the fifth period, extending from the end of flowering to the commencement of ripening. It is seen that, from the beginning of growth until the formation of its grain, the stem of the wheat-plant accumulates in its tissues increasing quantities of mineral matter, by the aid of which it builds up its organic substance. From this time onward it takes nothing more from the outer world ; it, in fact, ceases to grow, but matures its grain from the materials which it has already stored up in its different organs. Detached from its roots, the wheat-plant completes the final stage of its development equally as well as when still connected with the soil. Consequently, an earlier cutting in wet seasons can be resorted to without any detriment to the ripening of the grain, and it further may be made the means of protecting the ears from inclement weather. Placing the sheaves temporarily in *meulons* is, therefore, strongly recommended to French cultivators, but it is desirable that the work should, if possible, be done on a dry day in order to avoid including water in the sheaves.

THE HORSE AND ITS HISTORIANS.

WRITING on this subject in the *Zoologist*, Mr. J. E. Harting says that should any one feel disposed to collect all the works that have been written relating to the horse he would have to provide shelf-room for at least 4,000 volumes. These would include works on the natural history, anatomy, and physiology of the horse ; its dentition, diseases, and cures ; its use and treatment in relation to agriculture, cavalry, hunting, and racing ; with treatises innumerable on equitation, breaking, training, and stable management ; bits and bridles, saddles, and harness of every description. Since the days of Xenophon (a.c. 380) down to the issue of the volumes on hunting and racing in the "Badminton Library" (A.D. 1886), there have appeared as many as 3,800 works on the horse, in eighteen different languages. The earliest works are in Greek, but Greece can claim no modern author ; of Latin works there are twenty-six, of which three only belong to the present century. The number of works on hippology in the English language does not fall far short of a thousand, though the names of those authors who have written for all time would not make a very long list. The earliest English works relating to the horse are concerned chiefly with hunting. They include *The Art of Hunting*, by William Twici, written originally in Norman-French, about the year 1307, by the huntsman to King Edward II. ; the treatise on hunting in the *Boke of St. Albans*, 1486 ; and Turbervile's *Booke of Hunting*, 1575, a second edition of which appeared in 1611.

Amongst the earliest books on riding, by English writers, are Blundevile's *Four chiefest Offices belonging to Horsemanship*, 1655 ;

Astley's *Art of Riding*, 1584; Clifford's *School of Horsemanship*, 1585; Gervase Markham's *Discourse of Horsemanshippe*, 1593; and his *Cavelaire, or the English Horseman*, 1607; the last-named writer being also the author of several other works of a somewhat wider scope, such as the treatise on horses in his *Country Contentments*, 1611; *Markham's Maister Piece*, 1615; and his *Faithful Farrier*, 1635, all of which passed through several editions and were very popular in their day. De Grey's *Compleat Horseman*, 1639, many times reprinted, was another popular book. In the time of Charles II. there appeared (1683) rather a notable work on the *Anatomy of the Horse*, by Andrew Snape, farrier to his Majesty—sufficiently esteemed to be translated into French, and to pass through three or four editions. Nearly a century later, *An Anatomical Description of the Bones in the Foot of the Horse*, by James Clark of Edinburgh (1770), and the same author's *Observations on the Shoeing of Horses*, attracted considerable attention, and were translated into German; while later still the name of Bracy Clark became well known through his numerous treatises on the anatomy and pathology of the horse, his first essay, *On the Bots in Horses*, appearing in 1796.

The earliest treatise on horse-breeding by an Englishman, though it was written in Latin, was the work of Richard Sadler, 1587. The first English book on racing is Gervase Markham's *How to Choose, Ride, Train, and Dyet both Hunting and Running Horses*. It at first formed part of his *Discourse of Horsemanshippe*, 1593, but in 1596 was separately printed. The oldest English work on the natural history and external form of the horse is probably Topsell's *Historie of Four-footed Beastes*, 1607, although it is obviously a compilation from older authors of different nationality.

Of the nearly one thousand English books on the horse, almost one-half have been printed since 1850. At least 919 works on the horse in the French language have been enumerated, no less than 580 of which have appeared since 1850. But although prior to 1800 there were twice as many English as French books on the subject, during the last five-and-thirty years the latter have exceeded the former by 116. The most voluminous writers have, however, been the Germans, no fewer than 1,252 books on the horse standing to their credit up to 1886. These comprise more works relating to anatomy, veterinary practice, and cavalry than exist in English, but fewer dealing with hunting and racing. On equitation, breaking, training, and stable management, the authorship is pretty equally divided. Next to the French, who stand third on the list after the Germans and English, come the Italians with 167 works, and the Spanish with 127. Swedish and Danish have each produced 62 works, Dutch 30, Portuguese 12, Norwegian 9, Polish 8, and Hungarian 3, whilst at least 10 are of Eastern origin. These statistics serve to show not only the importance attached to the history of the horse, but the share which different nations have contributed to the literature of the subject in all its branches.

VEGETABLE AND FRUIT FARMING.

It is a gratifying sign of the increasing interest taken in the minor products of cultivation that a second edition of Mr. Whitehead's pamphlet on Vegetable and Fruit Farming, originally published in the Journal, should have gone out of print immediately on its publication last April, and that a third edition should have been called for.¹ The pamphlet has been thoroughly revised and brought up to date by the author, and a section on fruit-drying has been added. Abounding as it does in practical suggestions, the circulation of the pamphlet amongst villagers, occupiers of allotments, and other cultivators could not fail to yield useful results.

That the foreign producer is finding in this country a market which should be supplied from home growth is shown by the circumstance that the value of vegetables, "unenumerated," imported into this country from foreign countries in 1888, was 621,775*l.*, as against 264,525*l.* in 1878. In 1888 France sent 308,813*l.* worth of vegetables to Great Britain, whilst Holland, Germany, the United States, and Spain respectively sent vegetables of the value of 58,932*l.*, 45,781*l.*, 44,106*l.*, and 33,229*l.*

The following tables showing the dates of the arrival in England of vegetables from different countries, the prices made for them, and the average prices for English vegetables, with the approximate time of their arrival in market, should prove useful and instructive to home growers.

IMPORTED VEGETABLES.

Name of Vegetable	Date of Arrival	Country from which sent	Price
New Potatoes	Jan. to May	{ Algiers and South of France; Lisbon, Holland }	2 <i>d.</i> to 4 <i>d.</i> per lb.
Asparagus	Mar. to June	{ Spain and France: Toulouse, Dijon, Paris }	4 <i>d.</i> to 1 <i>s.</i> per bundle
Cauliflowers	Feb. to April	{ North of France and Channel Islands }	7 <i>d.</i> to 1 <i>s.</i> 6 <i>d.</i> per doz.
French Beans	April to June	France	6 <i>d.</i> to 1 <i>s.</i> per. lb.
Peas	Jan. to July	{ Africa and France: Algiers, Bordeaux, Toulon }	3 <i>d.</i> to 8 <i>d.</i> per lb.
Lettuces	Dec. to June	France (Paris)	6 <i>d.</i> to 1 <i>s.</i> 2 <i>d.</i> per doz.
Radishes	April	France (Paris)	4 <i>d.</i> to 1 <i>s.</i> doz. bunches
Endive	Dec. to Aug.	France (Paris)	1 <i>s.</i> to 1 <i>s.</i> 9 <i>d.</i> doz. heads
Onions	Dec. to Feb.	{ Lisbon, France, Holland }	3 <i>s.</i> to 8 <i>s.</i> per cwt.
Carrots	April	France	3 <i>d.</i> to 10 <i>d.</i> per bunch
Cucumbers	May	Holland	1 <i>s.</i> 6 <i>d.</i> per doz.

¹ *Hints on Vegetable and Fruit Farming.* By Charles Whitehead, F.L.S., F.G.S. Third Edition. Pp. 42, and 5 illustrations. Price 6*d.* (London: John Murray, 1890.)

ENGLISH VEGETABLES.

Name of Vegetable	Date of Arrival at Market	Price	Estimated average Crop per acre
Potatoes, New . . .	End of June	Not quite 1 <i>d.</i> per lb.	4 tons 10 cwt.
Asparagus . . .	May . . .	1 <i>s.</i> 3 <i>d.</i> to 3 <i>s.</i> per 100 hds.	
Cauliflowers . . .	End of April	8 <i>d.</i> to 1 <i>s.</i> 4 <i>d.</i> per doz.	
Scarlet-runners . . .	July . . .	2 <i>s.</i> to 3 <i>s.</i> per bushel	300 bushels
Peas . . .	End of June	2 <i>s.</i> to 3 <i>s.</i> 6 <i>d.</i> per bushel	150 bushels
Lettuces . . .	End of May	6 <i>d.</i> to 1 <i>s.</i> per score . .	1,400 score
Radishes . . .	May . . .	4 <i>d.</i> to 8 <i>d.</i> per doz. bchs.	1,200 doz. bunches
Onions . . .	May . . .	1 <i>s.</i> to 2 <i>s.</i> 6 <i>d.</i>	
Carrots . . .	June . . .	1 <i>s.</i> 6 <i>d.</i> to 2 <i>s.</i> 9 <i>d.</i> . . .	400 doz. bunches
Cucumbers . . .	July . . .	6 <i>d.</i> to 2 <i>s.</i> 6 <i>d.</i> per doz. .	200 barrels
Cabbages . . .	End of April	1 <i>s.</i> to 2 <i>s.</i> 9 <i>d.</i> per 5 doz.	1,000 dozen
Coleworts . . .	{ Feb., ac- cording to season }	9 <i>d.</i> to 4 <i>s.</i> per doz. bchs.	250 doz. bunches
Marrows . . .	August . .	6 <i>d.</i> per dozen.	

Under this head reference may also be made to a treatise¹ by the Editor of the *Gardening World*. It is of a most practical and useful nature, and as it is published at the low price of sixpence, it is within the means of the most humble fruit grower.

The author first sets forth the undoubted fact that "there has arisen of late a popular demand not only for a greater fruit production in this country, but specially for those hardy fruits which serve so largely as food for the people." Then, after alluding to the reasons which had caused this taste for fruit, Mr. Wynne points out the "right course," which is to grow such hardy fruits as are peculiarly fitted for the climate, on the one hand, and available for preserving, or jam making, on the other.

Teaching fruit culture in schools is advocated by Mr. Wynne, who hopes that the recent appointment of a Minister of Agriculture will lead to the development of means for imparting practical knowledge of it through his Department, as fruit culture, though usually termed horticulture, or gardening, is closely related to agriculture, the chief industry of rural life.

"To the bulk of the cottager or allotment holder element practical information on fruit culture comes as a sort of revelation. The bulk of our labourers and artisans who have gardens have only the most imperfect information on the culture of fruit, whilst vast numbers of them can produce flowers and vegetables admirably. If fruit culture is to be common as well as successful, it must be based on knowledge made easy, and that knowledge it is the object of this little book to furnish."

¹ *Our Hardy Fruits: a Practical Guide to their Cultivation for Land-owners, Tenant Farmers, Cottagers, and Allotment Holders.* By Brian Wynne, F.R.H.S. (Eyre and Spottiswoode.)

Mr. Wynne then urges that it is the duty of landlords to assist tenants by bearing the whole, or some agreed portion, of the first cost of the trees and planting, taking care that only suitable land is planted and proper kinds of fruit selected. He suggests that landowners should establish "experimental orchards in connection with their garden establishments and under the charge of their head gardeners," where all kinds of hardy fruits should be grown for the information of tenants.

Most clear and concise details are given of each "hardy fruit" recommended for cultivation, as to the sorts to be planted, the soil and situation to be chosen, the way of managing the trees, or bushes, or plants, as to pruning, cutting, manuring, picking and packing. Besides all this, nearly twenty pages of the work are devoted to descriptions of insects injurious to fruit crops, with means of prevention against their attacks, so that it seems to furnish all the information that fruit growers can possibly require.

FOOD-VALUE OF THE WHEAT-GERM.

UNDER the name of *fromentine* or *embryo-farine* (flour embryo) a new alimentary material is being subjected to trial in various hospitals in France, and is made the subject of a report by the Société des Sciences, Agriculture et Arts de la Basse-Alsace. It consists of the embryo-plant which can be seen as a small oval structure at the base of the grain of wheat, and which, after germination, develops into the wheat-plant. This little structure is known to English millers as the "chit," and is discarded in the process of milling. According to Kick, the germ is made up of a great number of very small thin-walled cells, and is less friable, on account of its oily nature, than the rest of the grain. It is found, however, to be very rich in nitrogenous matter, yielding on analysis 51·30 per cent. of albuminoids, 29·08 of carbohydrates other than cellulose, 12·03 of cellulose, and 6·98 of mineral matter or ash. Over 50 per cent. of nitrogenous matter is a great deal more than is to be found in meat, for the richest kind of meat—that of the sheep—contains only 21 per cent. of nitrogen; the proportion of digestible matter in fromentine attains, moreover, 87 per cent. of the total weight.

A desirable quality in any kind of aliment is that, besides being digestible, its digestion should be easy and not fatigue the stomach. This wheat-germ contains the ferment known as diastase in quantity sufficient not only to ensure easy digestion but to promote also the digestion of other foods. The quantity of diastase in the wheat-germ is, in fact, enough to effect the conversion of all the insoluble starch of the grain into soluble sugar, in the same way as the similar ferment in barley converts the starch of that grain

into sugar on the floor of the malt-house. The weight of the starch in a grain of wheat is about 140 times the weight of the germ. It is claimed for fromentine, therefore, that it possesses a high value as a food for infants, convalescents, and anæmic subjects.

Much difficulty has arisen in the attempt to separate the wheat-germ in the process of milling, the structure being so small that it requires about eighty germs to weigh one grain Troy. M. Schweitzer has, however, devised an apparatus whereby the wheat-grain is passed through triangular grooves, split lengthwise, and the germ set free and removed by a brush in the process of bolting. Flour made from the split wheat-grains is not liable to become rancid, for the unstable essential oil which the germ contains is carried away in that structure. All attempts to remove this oil by chemical processes having failed, the problem has only recently been solved by mechanical means. Freed from the oil, the germs keep well; they have the appearance of a grey powder of agreeable taste, not unlike that of the hazel-nut. Biscuits, pastry, &c., can be made from them without any addition of ordinary flour. It is hoped that it will be possible to advantageously utilise fromentine in place of the famous *saucisse aux pois* (pease-sausages) employed by French soldiers during active service.

The production of fromentine is, however, very restricted. From 1,000 lb. of wheat it is hardly possible to obtain more than 5 lb., yielding actually only 4 lb. of fromentine containing 3.5 lb. of assimilable material. But it is suggested that the germs of barley, oats, maize, &c., may be similarly utilised, for they likewise contain a large proportion of nitrogenous ingredients; and it is possible that a new field of industrial research may be opened up in this direction. It is, in any case, interesting to learn that in fromentine, a substance of exclusively vegetable origin, there exists a percentage of nitrogen much higher than that contained in the best kinds of meat.

HEREDITY AND SEXUALITY.

IN a series of articles entitled "Observations sur l'Hérédité" communicated to the *Journal de l'Agriculture*, M. Jean Kiener, of Walbach, Haute-Alsace, places on record a number of facts interesting to breeders. Hereditary influence he regards as controlled by two factors—the parents whose characters are transmitted to the offspring, and the environment, which aids in moulding or modifying the latter. As an instance of the influence of environment is mentioned the difficulty of replacing a local race or breed by an imported one. The imported stock becomes gradually modified, and assimilated in character to the local race, though by the exercise of care and selection on the part of the breeder the original characteristics

may be preserved. An example is afforded in the Dutch cattle imported into Alsace, which, in the fourth generation, had, excepting in colour, quite assumed the conformation of the native cattle, though it is alleged that no admixture of native blood had taken place. Illustrations of rapidly effected changes are afforded in the circumstance that Vilmorin, in four consecutive generations, obtained the cultivated from the wild carrot; Flourens, also in four generations, obtained a perfect dog from a cross between a she-wolf and a dog. Vilmorin has demonstrated that the parental influence, or, as he terms it, the *immediate* influence, is stronger than all others. From a hairy lupin (*Lupinus hirsutus*), bearing blue and red inflorescences, he selected a branch with only blue flowers, by cultivation from which the red flowers became fewer and finally disappeared.

The result of crossing a common mare with a half-bred or pure-bred horse is discussed. She may be a good mare, excellent for draught purposes, equal to her work, free from maladies and vices, and standing a less height than the stallion. The latter, a half-bred perhaps, has a fairly noble carriage, but the head a little heavy, the neck too short, the shoulders insufficiently sloping, the arms too small, the elbows contracted. The forelegs are well developed, the knees wide enough but wanting in length, and the fetlocks cover some deficiency of bony substance, though the general structure of the foot is satisfactory. There are some defects in the hind quarters, but the hind limbs as a whole will bear scrutiny. What will be the offspring of such a cross? Usually the head will be too bold, the eye small, the neck without distinctive feature, the limbs slender, the knees small, the tendons slighter than in either sire or dam, the fetlock bad, the pastern bone too fine, the inferior size of the hoofs will recall those of the pure-bred grandsire, and, moreover, the offspring is not likely to be good-tempered. By the second or third generation, under the influence of care and good nourishment, many of the defects will, however, have disappeared.

Passing to the examination of various parts of the body in farm animals, M. Kiener states that he has often seen, in crosses between Dutch cattle and shorthorns, the design of the coat to correspond with that of the one breed, and the coloration with that of the other. The shorthorn Dutch cross-bred has sometimes the pattern of the coat of the shorthorn sire with the black colouring of the Dutch dam. As regards *size*, it is inexpedient to mate together large sires and small dams, whilst it is beyond question that the use of small sires upon larger dams, as in the case of Arab stallions and French mares, or of Asiatic boars and French sows, has yielded excellent results. The *head* is chosen by systematists as the main guide to classification of species of the same genus, and from its characters are deduced those of the entire skeleton; but, however reliable this may be in the case of a pure breed, it is decidedly misleading in the case of cross-breeds.

Many examples are quoted tending to show that neither of the parents enjoys a monopoly in the transmission of characters. In other words, the offspring may derive its peculiarities from either

parent, or from both parents. Thirty years' observation has convinced M. Kiener that the milking propensity, for example, is quite as transmissible through the male as through the female line, and, in view of the large number of offspring of one bull as compared with those of one cow, he argues that the milking aptitude is preferably propagated through the male. He adds that bulls of good dairy character are distinguished by the possession of fairly developed teats.

Ancestral influence is undeniable, though under what combination of circumstances it is most likely to manifest itself it is difficult to say. The influence of the male in close in-and-in breeding is of the highest importance. A pure-bred Dutch cow threw two consecutive calves to her own male offspring, the result of an alliance with a Swiss-Dutch cross-bred bull. Possessing three-fourths of the blood of their dam, they might have been expected to resemble her, but did not. Though the two calves differed from each other, yet each exhibited strongly certain characteristics of their sire (and brother). An almost pure-bred St. Hubert bitch, covered by a grey-and-black mastiff, gave birth to a dog with hair like that of his sire. Allied to his dam, this dog produced a son, which was also his brother, and which had the same kind of coat as his sire, though rather more resemblance to his dam, who was at the same time his grand-dam. But what is most surprising is that this last-named offspring, allied to the bitch who was his dam and grand-dam, produced eight dogs, four of which were grey and four black. From the very strong preponderance of the maternal blood, it would hardly have been surprising if these eight puppies had borne a greater resemblance to their dam. In March last these eight dogs were a year old and were in good health, and it remains to be seen whether they will prove as good in the chase as their mother and their brothers, the latter being also their sire and grandsire respectively.

For the transmission of hereditary disease it is not necessary that more than one of the parents should be the medium. A case is mentioned of a stallion carrying a small bony tumour on the jaw; many of his offspring were similarly affected. The transmission of spavin from the stallion or from the mare is also instanced.

The experiences and observations of many years have led M. Kiener to the conclusion that it will never come within the capacity of the breeder to control the sex of the offspring. The age of the parents appears to exercise no influence upon the sex, and as from old females—mares, cows, she-goats—allied always to males in full vigour, M. Kiener has obtained a much larger number of female than of male offspring, he considers that the more robust parent does not necessarily determine the sex.

Professor Ch. Cornevin, of the Veterinary School at Lyons, deals with a closely allied subject in a paper "*Contribution à l'Étude du Déterminisme de la Sexualité.*" The progress of the study of embryology has placed beyond doubt the circumstance that in the animal kingdom, the bisexual or hermaphrodite condition is the usual and primitive state, the unisexual condition being the result of the

more or less complete suppression of the one kind of sexual apparatus in favour of the other, which consequently develops the more fully. The embryos of vertebrate animals are at first hermaphrodite—a condition which is very commonly permanent amongst invertebrates, and is occasionally more or less so in the case of vertebrates. In plants, hermaphroditism is the rule the unisexual condition the exception.

If the proportions of the sexes at birth be taken as a standard, it is found that normally the two sexes about balance each other in the case of the human species and of the domesticated animals, though with a slight predominance of males. Statistics of the European countries give an average of 105 boys born for every 100 girls. According to M. Cornevin's observations, the ratios in the case of farm animals are :—horses, 101 males per 100 females ; cattle, 104·6 males ; sheep, 115·4 ; pigs, 104·9. Change in the environment appears to be one of the most potent causes in the determination of sex, and, as regards the human race, observations on this point are easily made. In hot countries to which white people have migrated there is a preponderance of girls at birth. Thus, in Java, of 7 births amongst Europeans, 5 are girls and 2 boys ; in Yucatan of 10 births, 8 are girls. Horses equally serve to afford evidence that, in an environment different from their native one, there is an excess of female births. At the French national horse-breeding establishment at Pompadour, European-bred animals are mated with Arabs, imported direct from the East. M. Rélier, veterinarian to the establishment, has drawn up the following table :—

Years	Pure-breds and Anglo-Arabs, born of parents of European origin		Arabs, born of parents imported from the East	
	Colts	Fillies	Colts	Fillies
1873	—	—	7	3
1874	—	—	4	6
1875	—	6	4	5
1876	9	1	6	13
1877	7	5	10	11
1878	5	7	10	9
1879	16	6	11	11
1880	10	15	12	12
1881	12	11	7	12
1882	14	9	7	15
1883	8	20	7	10
1884	12	9	8	7
1885	14	9	4	7
1886	14	21	4	3
1887	15	16	5	4
1888	13	12	2	3
1889	15	12	6	1
17 years	164	159	114	132

It is seen that, of the European foals, pure-bred or half-bred, there are 164 colts to 159 fillies ; whilst, of the Arabs, away from

their native environment, there are 114 colts to 132 fillies. Reduced to percentages these figures give :—European produce, 103·1 males to 100 females ; Arab produce, 86·7 males to 100 females ; difference, 16·4. As all the animals of the haras live side by side and are subjected to like treatment throughout, M. Cornevin considers that the results stated may be legitimately attributed to the influence of the environment. He does not, however, discuss the circumstance that the results of individual years are, as the table shows, frequently at variance with the general result on which he bases his conclusion.

RECENT AGRICULTURAL INVENTIONS,

The subjects of Applications for Patents from March 22 to May 28, 1890.

Agricultural Machinery and Implements, &c.

No. of Application	Name of Applicant	Title of Invention
4154	SHEPHERD, G. H.	Lawn mowers.
4167	MARSHALL, J.	Additions to threshing, to fit them for use in threshing or stripping and shelling clover or trefoil.
4176	PARKINSON, T. and G. M.	Sieves for purifying, grading, or conditioning grain and other substances.
4214	BALLACH, A.	Drill sowing-machines, for turnip and other seed.
4245	ROWE, G. E.	Mowing and reaping machines.
4380	MILES, F. A., and anr.	Potato planting machines.
4381	ARTER, A. C.	Reaping and mowing machines.
4461	HOBNSBY, J., and anr.	Sheaf-binding apparatus.
4493	WEIR, W., and another	Agricultural harrows.
4521	LEONARD, H. S.	Husking trefoil.
4527	HORN, W. W.	Transmitting fertilisers.
4556	RAINFORTH and others	Screens for dressing corn.
5184	THOMPSON, W. P.	Grain elevators.
5220	COMERFORD, J.	Drying grain after washing.
5484	PRATT, E.	Raising and lowering trusses of hay from ricks.
5743	STARKEY, T.	Bending hay forks, &c., into shape.
5921	THOMAS, H. M.	Sheep-shearing machines.
5963	MAYNARD, R.	Elevators.
6128	CORK, J.	Gathering or elevating cut corn, &c.
6176	BARKER, G.	Harvest binders.
6360	BOLLÉ, C.	Wheel ploughs.
6390	EVANS, E.	Grain-binding harvesters.
6938	WOODROFFE, F. K.	Grinding, crushing or kibbling grain.
6986	PECKMAN, E. A., & anr.	Shades.
7110	BAYLY, J. P.	Harrow.
7112	BAYLY, J. P.	Garden hoe.
7212	NEWCOME, H. J.	Automatic elevator.
7151	TUCKER, J.	Elevators.
7385	LIVENS	Threshing machines.
7461	BRABY, J.	Agricultural windlass.
7539	HOBNSBY and others	Reaping machines.

No. of Application	Name of Applicant	Title of Invention
7746	MASON and another .	Clip for fixing the tines of scarifiers.
7813	GOUDE, H., and others .	Hand baling-press for cut hay, &c.
7892	ATTERTON, J. .	Machine for washing potatoes, &c.
7937	CLAYTON, N., & others .	Threshing and winnowing machines.
8041	MCGREGOR, A. .	Reaping and mowing machines.
8048	BATLY, J. P. .	Potato digger.
8132	PEARSE, T. .	Framework of agricultural rollers.

Stable Utensils and Fittings—Horse-shoes, &c.

4133	O'BRIEN, G. .	Metal shoes for horses, &c.
4174	TOCHOFEN, F. .	Rein clamp.
4233	GILBANKS, H. .	Horse-shoes.
4279	CLOWES, T. .	Riding saddles.
4330	CUMMINGS, W. G., & anr.	Side-saddles ("safety lock head").
4344	MCDONALD, J. .	Whip sockets.
4568	FREEMAN, W. .	Halters.
4766	GRIFFITHS, J. V. .	Horse-shoes.
5166	KOLLÉN, A. B. J. .	Horse-shoe nails.
5357	SCHATZ, C. H. B. .	Shoeing horses, &c.
5392	CAMERON, D. .	Bridle bit.
5412	THOMPSON, W. P. .	Harness trace fasteners.
5467	LARDONNOIS, N. A. .	Instantaneous harnessing and unharnessing.
5523	DYER, S. C. .	Automatically-releasing a thrown rider.
5528	GLADSTONE, E. .	Preventing harnessed horses from falling.
5631	RAMSFORD, R. .	Portable car-stall for horses, &c.
5800	REID, J. .	Elastic traces for animal traction.
5846	EDWARDS, E. .	Whiplash holder.
5885	SAMPLE, H. .	Taming or subduing horses.
6011	BROAD, C. .	Corn measuring apparatus for stables.
6074	BENN, H. .	Keeping the manes of horses in order.
6224	LAKE, H. H. .	Horse-shoes.
6255	GALVAYNE, S. F. .	Breaking or taming gear for horses.
6378	MURPHY, T. .	Horse-shoes.
6456	BRAUN, W., and another	Horse-shoe of two parts, with exchangeable elastic inlays.
6551	PEDLEY, W. C. .	Hoof-pads for horses, &c.
6576	MACKEY, S. W. .	Hoof expanders.
6742	HUTCHISON, E. .	Novel horse-shoe and material for the purpose.
6911	HOOPER, H. W. .	Iron and steel horse roughs.
7435	DERUELLE, E. .	Horse-shoes.
7510	WITTEY, G. C. .	New material for horse-shoes.
7557	STONEHAM, J. .	Horse detacher.
7576	WHITE, D. .	Hames.
7605	WHITEHEAD, J. .	Harness.
7693	RAINSFORD, J. R. .	Combined snaffle and curb rein.
7939	ADAMS, D. .	Harness.

Carts and Carriages.

4410	HARRISON, J. .	Cee, elliptical and other leaf springs.
4454	FELSTEAD, C. and anr.	Double action lever spring brake.
4710	READER .	Preventing overturning of vehicles.
4902	MANN, M. F. J. .	Brakes.
5032	DOWELL, J. S. .	Brakes or Skids for waggon, &c.
5454	YORKE, A. F. .	Portable pony cart.
5617	CHALMERS, E. S. & anr.	Drags or brakes.
5822	SIMPSON, H. .	Carts, waggon, and vans.

No. of Application	Name of Applicant	Title of Invention
6232	ROWBOTHAM, T. .	. Self-lubricating adjustable wheels, &c.
6967	GREENWOOD .	. Enabling a horse to ride with the vehicle which may be going at a galloping speed while the horse is only walking.
7103	YORKE, A. F. .	. Portable two-wheeled carriage.

Dairy Utensils, &c.

4266	JACOBY, P. . .	. Automatic apparatus to sterilize milk.
4332	HARRIS, H. D. .	. Delivering milk at house doors.
4623	WAHLIN and others	. Separator for cream and butter.
4637	HARLOW, C. . .	. Refrigerator
5312	ADAMS, H. . . .	. Milk flask.
5395	VAUGHAN, G. E. .	. Apparatus for milking cows.
5850	JAMES, A. M. and anr.	. Appliance for delivery and reception of milk, &c., by householders.
6190	OETTLI, J. . . .	. Apparatus for sterilizing milk.
6253	PRESTON, J., and anr.	. Railway milk cans.
6797	CHEKASSOV, A. I. .	. Butter churns.
6883	CLARKE, W. J. . .	. Preserving milk and cream.
6901	TICHBORNE, C. B. C. & anr.	. Aerated milk.
7064	DRUMMOND, T. L. .	. Handles for holding ends of wire for cutting cheese, &c.
7543	BAYLY, J. P. . . .	. Butter crate.
7582	WISE, H.	. Refrigerating, &c., milk.
7778	HILLIER, A. . . .	. Handle for milking-pails.
7779	HILLIER, A. . . .	. Handles for cheese-vats.
8003	COLE, W.	. Centrifugal separators.
8020	LISTER, R. A., and anr.	. Pumps for milk, &c.

Poultry and Game, &c., Appliances.

4413	GRELL, J. H. . . .	. Feeding house for birds.
4643	HEARSON, C. E. . .	. Cramming poultry.
4357	CASHMORE	. Incubators.
4979	THOMAS, G. W. . .	. Preserving eggs.
5221	MEE, P., & HAND, J. W.	. Pigeon cotes.
5414	MAYES, J.	. Hatching pens.
6319	LACY, H.	. Testing eggs.
6717	FREETH, F. H. . .	. Packing eggs, &c.
6891	BAYLY, J. P. . . .	. Folding egg carrier and carrier tray.

Miscellaneous.

4343	BAKER, G.	. Dog, &c., muzzles.
4554	SCHOVELLER, J. . .	. Cooked food for horses, &c.
4721	WATSON, H.	. Malt-drying kilns.
4908	FRY, G.	. Garden pots.
4987	COOPER, A. J. . . .	. Rat and mouse trap.
5186	HILL, W.	. Muzzles for dogs.
5298	BARLOW, J., and another	. Self-setting vermin trap.
5307	CAMPBELL, R. . . .	. Fumigator for destroying insects in plants.
5509	WHITE, W. N. . . .	. Case for packing dairy and vegetable produce.
5614	FLETCHER, J. M. . .	. Compression and preservation of vegetable products.
5747	MARTIN, E.	. Flower-pots and seed-pans.
5765	KING, H., and another	. Pressing linseed, &c.

No. of Application	Name of Applicant	Title of Invention
5999	COLE, W.	Scoring pork.
6065	WILLIAMS, H.	Destroying rabbits and rats.
6198	HORN, W. W.	Fruit picker.
6279	TRESCHOW, M.	Machine for scraping carcasses of pigs.
6655	BAYLY, J. P.	Device for hitching animals.
6659	BAYLY, J. P.	Laying out orchards.
6752	BECKWITH, G. O.	Automatic clipping apparatus for animals.
6767	HEWETSON, W.	A calf sucking preventer.
6962	ASHBERRY, P. and anr.	Mechanical clippers for sheep, &c.
7080	STEVENS, G. W.	Destroying slugs, snails, &c.
7200	WARD, H.	Machine for levelling and bundling asparagus.
7325	MUIRHEAD, R.	Distributing liquid insecticide, &c.
7697	COTTON, W.	Improved feeding trough.
8078	MARTIN, A.	Clipping or shearing animals.
8098	HARVEY, J. R.	Holding comb foundation in beehives.
8137	OLDAKER, W.	Drench bottle.

Numbers of Specifications Published¹

(with prices in parentheses).

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¹ Copies may be obtained at the Patent Office (Sale and Store Branch),
 25 Cursitor Street, London, E.C.

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

TABLE I.—AVERAGE PRICES OF BRITISH CORN PER QUARTER (Imperial measure) as received from the Inspectors and Officers of Excise according to the Act of 27 & 28 Vict. ch. 87, in each week of the year 1889.

[From the "London Gazette."]

Week ending	Wheat	Barley	Oats	Week ending	Wheat	Barley	Oats
1889	s. d.	s. d.	s. d.	1889	s. d.	s. d.	s. d.
January 5 .	30 4	26 9	16 6	July 6 .	28 4	20 9	19 7
January 12 .	30 2	26 8	16 6	July 13 .	29 3	19 9	18 11
January 19 .	30 2	27 0	16 4	July 20 .	29 4	21 1	19 3
January 26 .	30 1	26 7	16 3	July 27 .	30 0	25 0	19 10
February 2 .	29 9	26 7	16 2	August 3 .	30 8	19 11	20 6
February 9 .	29 7	26 4	16 7	August 10 .	30 11	19 10	19 5
February 16 .	29 6	26 2	16 5	August 17 .	30 9	19 5	19 5
February 23 .	29 5	26 5	16 8	August 24 .	30 5	19 6	18 11
March 2 .	29 7	26 1	16 8	August 31 .	31 2	24 6	19 6
March 9 .	30 1	26 0	16 10	September 7 .	31 0	29 9	19 2
March 16 .	30 2	25 10	17 2	September 14 .	30 2	28 10	17 11
March 23 .	30 5	26 0	17 0	September 21 .	29 5	28 11	17 3
March 30 .	30 2	25 7	16 11	September 28 .	29 1	29 0	16 11
Average of Winter Quarter	29 11	26 3	16 7	Average of Summer Quarter	30 0	23 6	18 11
April 6 .	30 1	25 4	17 0	October 5 .	29 3	29 4	16 8
April 13 .	29 11	25 2	17 8	October 12 .	29 4	29 8	16 8
April 20 .	29 10	25 1	17 9	October 19 .	29 10	30 4	16 4
April 27 .	29 7	24 5	17 8	October 26 .	30 4	30 11	16 11
May 4 .	29 10	24 7	18 6	November 2 .	30 3	31 3	16 3
May 11 .	29 10	23 11	18 8	November 9 .	30 3	31 0	17 1
May 18 .	29 11	22 10	18 1	November 16 .	30 2	30 4	17 0
May 25 .	29 5	24 0	18 2	November 23 .	30 0	29 11	17 4
June 1 .	29 0	21 2	18 1	November 30 .	30 1	29 9	17 5
June 8 .	28 9	20 9	18 11	December 7 .	30 2	30 2	17 7
June 15 .	28 4	21 0	19 0	December 14 .	30 2	29 10	17 11
June 22 .	28 7	24 8	18 7	December 21 .	30 1	30 4	18 2
June 29 .	27 11	19 11	18 11	December 28 .	29 10	30 6	18 2
Average of Spring Quarter	29 3	23 3	18 2	Average of Autumn Quarter	29 11	30 3	17 2

TABLE II.—ANNUAL AVERAGE PRICES AND QUANTITIES OF BRITISH CORN sold in the Towns from which Returns are received under Acts 27 & 28 Vict. ch. 87, and 45 & 46 Vict. ch. 87, in each of the Years 1880 to 1889.

[From the "London Gazette."]

Year	Wheat		Barley		Oats		Wheat	Barley	Oats.
	s.	d.	s.	d.	s.	d.	Qrs.	Qrs.	Qrs.
1880	44	4	33	1	23	1	1,607,908	1,591,925	164,791
1881	45	4	31	11	21	9	1,738,255	1,631,504	211,444
1882	45	1	31	2	21	10	1,908,858	1,873,820	211,699
1883	41	7	31	10	21	5	2,901,146	2,575,528	408,471
1884	35	9	30	8	20	3	2,833,132	3,149,341	492,918
1885	32	10	30	2	20	7	2,739,515	2,765,500	393,042
1886	31	1	26	7	19	0	2,739,822	2,474,466	367,083
1887	32	6	25	4	16	3	2,495,124	2,589,667	309,478
1888	31	10	27	10	16	9	2,427,861	1,911,835	255,726
1889	29	9	25	10	17	9	2,945,408	3,329,814	415,783

TABLE III.—Returns published pursuant to the Corn Returns Act, 1882, and to Act of 6 & 7 Wm. IV. for *Commutation of Tithes in England and Wales*, showing what has been, during the Seven Years ending Christmas Day in each Year, the AVERAGE PRICE of an IMPERIAL BUSHEL of British Wheat, Barley, and Oats, computed from the Weekly Averages of Corn Returns in each of the years 1883-89.

[From the "London Gazette."]

Years	Average (Septennial) prices per bushel					
	Wheat		Barley		Oats	
	s.	d.	s.	d.	s.	d.
1883	5	2	3	11	2	8
1884	5	4 $\frac{3}{4}$	4	1 $\frac{3}{4}$	2	9
1885	5	1 $\frac{1}{4}$	3	11 $\frac{1}{4}$	2	8 $\frac{1}{2}$
1886	4	11	3	10	2	7 $\frac{1}{2}$
1887	4	8 $\frac{1}{2}$	3	8 $\frac{1}{2}$	2	6 $\frac{1}{2}$
1888	4	5 $\frac{1}{2}$	3	7 $\frac{1}{2}$	2	5
1889	4	2 $\frac{1}{2}$	3	6 $\frac{1}{2}$	2	4 $\frac{1}{2}$

TABLE IV.—COMPUTED REAL VALUE OF CORN IMPORTED INTO THE UNITED KINGDOM IN EACH OF THE SEVEN YEARS 1883-89.

[From Trade and Navigation Returns.]

	1883	1884	1885	1886	1887	1888	1889
	£	£	£	£	£	£	£
Wheat . . .	31,434,888	19,825,021	24,066,013	17,888,155	21,336,902	21,971,331	22,530,888
Wheat Flour . . .	12,318,144	10,166,010	9,651,508	8,254,407	10,020,433	9,530,800	8,559,563
	43,753,032	29,991,031	33,717,521	26,142,562	31,356,335	31,502,131	31,090,401
Other kinds of Flour . . .	31,038	23,970	18,811	12,899	4,934	8,046	18,365
Barley . . .	5,784,504	4,223,722	4,528,823	3,968,437	3,769,272	6,069,190	4,968,947
Oats . . .	8,043,011	4,198,514	4,252,135	3,974,434	3,489,813	4,588,712	4,472,598
Maize . . .	10,314,307	7,303,089	8,473,863	7,614,113	7,535,946	6,981,307	8,580,080
Beans and Peas . . .	2,114,289	1,820,366	1,758,105	1,612,985	1,662,992	1,625,835	1,676,736
Total of Corn . . .	87,040,181	47,562,702	52,749,258	43,225,430	47,819,397	50,875,221	50,808,127

TABLE V.—QUANTITIES OF WHEAT, BARLEY, OATS, PEAS, BEANS, INDIAN CORN OR MAIZE, WHEATMEAL, AND FLOUR, IMPORTED IN THE FIVE YEARS 1885-89; ALSO THE COUNTRIES FROM WHICH THE WHEAT, WHEATMEAL, AND FLOUR WERE OBTAINED.

[From Trade and Navigation Returns.]

(Thousands ("000") omitted.)

	1885	1886	1887	1888	1889
Wheat from—	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Russia	11,986	3,710	5,523	21,369	21,322
Germany	1,983	1,318	1,552	3,265	2,589
France	3	3	71	20	127
Turkey and Roumania	1,063	539	587	1,601	667
Egypt	110	41	198	730	325
United States	24,279	24,621	30,505	14,647	17,016
Chili	1,623	1,702	2,206	1,486	573
British India	12,102	11,029	8,509	8,189	9,217
Australasia	5,279	739	1,347	2,316	1,406
British North America	1,746	3,081	3,965	1,089	1,168
Other countries	1,280	622	1,322	2,513	4,242
Total Wheat	61,454	47,405	55,785	57,225	58,602
Wheatmeal and Flour from—					
Germany	1,415	817	589	1,109	1,155
France	187	115	98	102	91
Austrian Territories	1,816	1,362	1,391	1,946	1,838
United States	11,728	11,473	14,873	12,557	10,068
British North America	281	770	959	785	1,169
Other countries	408	202	147	414	378
Total Wheatmeal and Flour	15,835	14,739	18,057	16,913	14,699
Barley	15,392	13,723	14,277	21,277	17,416
Oats	13,062	13,495	14,469	18,737	15,999
Peas	2,004	2,047	2,990	2,421	1,688
Beans	3,515	2,804	2,477	3,010	3,585
Indian Corn or Maize	31,468	30,998	31,123	25,338	36,203
Indian Corn Meal	14	10	6	15	24

TABLE VI.—NUMBER AND VALUE OF LIVE CATTLE, SHEEP, AND SWINE IMPORTED INTO THE UNITED KINGDOM IN THE UNDERMENTIONED YEARS.

[From Trade and Navigation Returns.]

		Number			Value		
		1887	1888	1889	1887	1888	1889
					£	£	£
Oxen and Bulls	From Denmark . .	25,079	27,385	30,047	295,295	334,451	359,245
	" Germany . .	7,873	10,304	—	123,672	176,347	—
	" Spain . .	6,653	11,484	11,587	108,428	188,614	190,754
	" Canada . .	62,537	58,761	82,207	1,089,352	1,086,269	1,424,731
	" United States . .	94,642	142,865	294,128	1,849,307	2,840,911	5,793,366
	" Other countries . .	22,438	36,467	23,842	336,601	554,245	365,372
Total . .		219,222	287,266	441,811	3,802,655	5,130,837	8,133,468
Cows	From Denmark . .	28,711	35,439	47,895	329,253	410,867	539,436
	" Sweden . .	1,872	3,061	2,887	22,983	34,648	32,409
	" Germany . .	2,263	4,239	—	32,908	66,415	—
	" Canada . .	2,588	2,216	2,237	45,470	40,354	39,342
	" United States . .	215	630	262	3,567	12,415	4,235
	" Other countries . .	3,117	4,139	7,085	54,882	70,283	116,913
Total . .		38,766	49,724	60,366	489,063	634,982	732,385
Calves	From Denmark . .	4,944	4,235	10,911	16,163	15,959	39,474
	" Holland . .	32,734	35,494	41,214	129,424	128,863	160,282
	" Canada . .	29	167	144	58	454	249
	" United States . .	1	—	33	5	—	111
	" Other countries . .	265	202	742	1,437	879	3,338
Total . .		37,973	40,098	53,044	147,087	146,155	203,454
Sheep and Lambs	From Denmark . .	97,845	94,454	153,362	134,843	134,949	226,163
	" Germany . .	321,085	299,589	193,191	554,596	536,851	318,939
	" Holland . .	501,701	498,458	198,036	867,673	954,268	422,129
	" Canada . .	35,473	45,339	55,857	65,738	89,272	111,128
	" United States . .	1,027	1,203	18,690	2,040	1,956	56,288
	" Other countries . .	14,272	17,167	58,923	20,947	23,253	80,760
Total . .		971,403	956,210	678,068	1,645,837	1,740,549	1,195,407
Swine	From Denmark . .	885	16,325	19,719	2,485	56,521	79,086
	" Holland . .	20,947	8,173	1,675	61,549	18,230	3,183
	" Canada . .	3	—	—	6	—	—
	" United States . .	—	—	—	—	—	—
	" Other countries . .	130	11	3,930	384	33	13,154
Total . .		21,965	24,509	25,324	64,424	74,784	95,373
Total value of all kinds . .		. . .	. . .	. . .	6,149,066	7,727,307	10,360,087

TABLE VII.—QUANTITY AND VALUE OF DEAD MEAT IMPORTED IN THE FOUR YEARS 1886-89.

[From Trade and Navigation Returns.]

Thousands ("000") omitted.

DEAD MEAT		1886		1887		1888		1889	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
BACON:—		Cwt.	£	Cwt.	£	Cwt.	£	Cwt.	£
From United States		2,578	4,321	2,203	4,229	1,885	3,853	2,548	4,810
" Other countries		678	1,322	798	2,101	989	2,540	950	2,477
Total		3,256	6,143	3,001	6,330	2,874	6,393	3,498	7,287
BEEF:—									
Salted	From United States	183	304	203	310	213	325	254	352
	" Other countries	12	22	15	24	13	24	11	19
Total		195	326	218	334	226	349	265	371
Fresh	From United States	782	1,768	645	1,456	785	1,815	1,270	2,812
	" Other countries	45	94	13	25	52	106	110	203
Total		807	1,862	658	1,481	837	1,921	1,380	3,015
HAMS:—									
From United States		841	1,971	814	2,097	647	1,697	873	2,217
" Other countries		102	266	107	293	81	227	104	284
Total		943	2,237	921	2,390	728	1,924	977	2,501
MEAT, Unenumerated:—									
Salted or Fresh {	From United States	3	3	6	13	8	6	22	43
	" Other countries	40	110	41	103	53	114	69	149
Total		42	113	47	116	56	120	91	197
Preserved, other- wise than by Salting	From Australasia	57	136	167	387	128	267	65	158
	" United States	293	663	228	531	263	630	412	932
" Other countries		80	368	124	432	151	490	166	544
Total		430	1,167	519	1,350	542	1,377	643	1,632
MUTTON, FRESH:—									
From Holland		59	131	63	152	88	190	78	175
" Australasia		383	842	441	925	543	1,104	613	1,292
" Other countries		217	432	281	500	358	647	536	1,112
Total		659	1,405	785	1,577	989	1,941	1,227	2,579
PORK:—									
Salted or Fresh (not Hams) {	From United States	313	295	192	375	150	238	192	283
	" Other countries	159	335	226	498	338	679	194	393
Total		372	630	418	773	488	917	386	676
TOTAL OF DEAD MEAT		6,697	13,882	6,577	14,351	6,720	14,942	5,467	12,958

TABLE VIII.—NUMBER OF HORSES, AND THEIR DECLARED VALUE, IMPORTED INTO, AND EXPORTED FROM, THE UNITED KINGDOM, IN EACH OF THE UNDERMENTIONED YEARS.

[From Annual Statements of Trade of the United Kingdom.]

Year	IMPORTED		Year	EXPORTED	
	Number	Value		Number	Value
		£			£
1885	13,023	195,624	1885	6,196	371,406
1886	11,026	189,901	1886	7,326	409,045
1887	11,641	197,679	1887	9,463	547,396
1888	11,505	192,624	1888	12,880	848,311
1889	13,859	275,401	1889	14,267	984,000

NOTE.—The countries from which horses were imported in 1889 were as follows:—Germany, 6,954; Denmark, 2,585; Holland, 1,660; France, 887; Belgium, 591; United States of America, 236; Canada, 119; and 827 from other countries.

TABLE IX.—AVERAGE PRICES OF WOOL IN EACH OF THE UNDERMENTIONED YEARS.¹

Years	ENGLISH								AUSTRALASIAN	SOUTH AFRICAN
	Leicester		Half-breds		Kent		Southdown			
	Per lb.		Per lb.		Per lb.		Per lb.			
1884	8½ to 9½		9 to 9½		9 to 9½		0 10 to 1 1½		1 0½	1 1½
1885	8½ " 9		8½ " 9½		9 " 9½		0 9 " 1 0½		0 10½	0 9½
1886	9 " 9		9½ " 10½		9½ " 10½		0 9½ " 1 0½		0 9½	0 9½
1887	9½ " 10½		10 " 11½		10½ " 10½		0 10½ " 1 0½		0 10½	0 10½
1888	9½ " 10½		9½ " 10½		9½ " 10½		0 9½ " 0 11½		0 10½	0 9½
1889	9 " 10		9 " 10		9 " 10		0 9 " 1 0		0 10½	0 10½

TABLE X.—QUANTITIES OF CERTAIN ARTICLES OF FOREIGN AND COLONIAL PRODUCTION IMPORTED IN THE YEARS 1886-89.

[From Trade and Navigation Returns.]

	1886	1887	1888	1889
Bones (burnt or not, or as animal charcoal) . tons	57,175	51,882	65,651	62,855
Cotton, Raw . . . cwt.	15,187,299	15,903,117	15,246,408	17,169,316
Flax "	1,287,034	1,560,696	1,833,650	1,783,189
Guano tons	68,744	21,251	25,052	26,804
Hemp cwt.	1,213,857	1,472,857	1,822,065	1,973,210
Hides untanned: Dry . "	721,964	627,132	585,254	575,158
" " Wet . "	499,271	523,393	576,176	647,250
Petroleum gallons	71,026,962	77,458,062	94,177,807	102,647,478
Oilseed Cakes . . . tons	296,530	265,694	259,573	256,296
Clover and Grass Seeds cwt.	289,214	335,858	334,432	296,314
Flax-seed and Linseed qrs.	2,081,283	2,341,175	2,542,027	2,272,019
Rape "	372,613	413,856	279,615	458,948
Sheep and Lambs' Wool lb.	591,872,167	574,196,058	635,936,244	696,896,186

¹ The prices of English wool have been calculated from the prices given weekly in the *Economist* newspaper. The figures relating to Australasian and South African wool have been taken from Returns furnished by the Board of Customs.

TABLE XI.—QUANTITIES AND VALUES OF BUTTER, MARGARINE, CHEESE, AND EGGS IMPORTED INTO THE UNITED KINGDOM IN EACH YEAR FROM 1887 TO 1889 INCLUSIVE.

[From Trade and Navigation Returns.]

	QUANTITIES			VALUES		
	1887	1888	1889	1887	1888	1889
BUTTER						
	cwt.	cwt.	cwt.	£	£	£
From Denmark . . .	487,603	604,512	677,491	2,669,125	3,335,064	3,743,576
" Germany . . .	156,430	160,915	111,027	793,579	813,198	588,660
" Holland . . .	164,474	155,020	151,073	851,467	784,523	767,457
" France . . .	416,067	439,993	566,524	2,264,669	2,378,835	3,073,473
" Canada . . .	32,623	9,173	22,634	139,566	40,779	95,167
" United States . .	52,329	23,207	110,187	213,712	93,243	448,825
" Other Countries .	205,379	276,494	288,533	1,084,651	1,456,533	1,526,570
Total . . .	1,514,905	1,669,314	1,927,469	8,016,769	8,902,193	10,243,728
MARGARINE						
	cwt.	cwt.	cwt.	£	£	£
From Norway . . .	16,650	7,734	11,051	61,962	25,045	33,399
" Holland . . .	1,172,074	1,043,401	1,137,094	3,546,591	2,951,522	3,280,628
" Belgium . . .	22,895	6,676	10,527	70,301	18,130	30,269
" Other Countries .	61,476	08,313	82,083	191,094	269,129	308,426
Total . . .	1,273,095	1,138,174	1,240,760	3,869,948	3,263,826	3,652,722
CHEESE						
	cwt.	cwt.	cwt.	£	£	£
From Holland . . .	362,014	328,801	327,384	683,934	822,498	807,037
" France . . .	30,260	29,304	32,941	99,667	92,428	106,057
" Canada . . .	631,837	667,461	675,900	1,552,764	1,523,833	1,565,526
" United States . .	739,463	812,430	827,626	1,847,412	1,905,776	1,899,864
" Other Countries .	50,893	79,545	45,694	125,160	197,743	116,070
Total . . .	1,834,467	1,917,541	1,909,545	4,508,937	4,542,278	4,494,554
EGGS						
	great hundreds	great hundreds	great hundreds	£	£	£
From Germany . . .	3,209,799	3,707,091	2,998,865	943,914	1,146,739	893,902
" Belgium . . .	1,678,420	1,582,929	1,817,353	552,598	490,011	565,057
" France . . .	3,070,525	2,692,057	2,950,566	1,251,688	1,053,309	1,181,335
" Other Countries .	1,111,093	1,338,540	1,649,855	332,361	387,050	482,519
Total . . .	9,069,837	9,320,617	9,416,639	3,080,561	3,077,109	3,122,813

TABLE XII.—NUMBER OF HORSES, CATTLE, SHEEP, AND PIGS IN THE UNDERMENTIONED COUNTRIES, FOR EACH OF THE YEARS INDICATED.

[From Board of Trade Returns.]

Countries	Years	Horses	Horned Cattle	Sheep and Lambs	Pigs
		No.	No.	No.	No.
United Kingdom	1887	1,936,925	10,639,980	29,401,750	3,720,957
	1888	1,936,702	10,268,600	28,938,716	3,815,645
	1889	1,945,386	10,272,765	29,484,744	3,908,885
Australasia	1886	1,373,346	8,228,628	86,245,720	1,053,453
	1887	1,438,551	8,678,574	97,233,986	1,071,773
	1888	1,455,623	9,106,695	96,121,148	1,071,773
Canada ¹	1886	617,376	2,192,099	1,643,534	941,446
	1887	629,144	2,158,308	1,440,136	868,530
	1888	596,213	1,929,638	1,349,044	819,079
Cape Colony	1888	266,150	1,292,039	13,177,265	142,479
	1889	295,370	1,502,845	14,463,445	166,835
Natal	1886	50,012	629,725	674,437	32,927
	1887	54,326	611,794	484,288	46,306
	1888	49,548	655,932	609,805	45,369
Austria	1889	1,394,623	7,421,915	5,036,392	2,551,973
	1890	1,463,232	8,584,077	3,841,840	2,721,541
Hungary	1870	2,158,819	5,279,193	15,076,997	4,443,279
	1880	2,078,528	5,311,375	9,886,133	4,160,127
	1884	1,748,369	4,879,038	10,594,531	4,803,639
Belgium	1886	253,163	1,242,445	586,097	632,301
	1890	271,974	1,382,615	365,400	646,375
Denmark	1876	352,262	1,349,321	1,719,249	503,667
	1881	347,661	1,470,078	1,548,613	527,417
	1886	375,533	1,459,627	1,225,196	770,785
France	1885	2,911,392	13,104,970	22,616,547	5,881,088
	1886	2,938,489	13,275,021	22,688,230	5,774,924
	1887	2,908,527	13,395,259	22,830,190	5,978,916
Germany	1873	3,352,331	15,776,702	34,999,406	7,124,068
	1883	3,522,945	15,786,764	19,159,715	8,206,195
Holland	1886	272,700	1,530,800	802,700	458,200
	1887	274,300	1,525,600	804,300	490,254
Italy	1875	657,544	3,489,125	6,977,104	1,553,582
	1881	660,123	4,783,232	8,596,108	1,163,916
Norway	1865	149,167	953,036	1,705,394	86,166
	1875	151,903	1,016,617	1,686,306	101,020
Russia in Europe	1877	17,589,118	27,323,219	51,822,238	10,839,093
	1882	20,015,659	23,645,104	47,608,966	9,207,666
	1883	17,890,793	23,628,031	46,724,736	9,361,980
Sweden	1885	480,330	2,366,286	1,442,396	515,556
	1886	484,885	2,381,467	1,443,676	548,210
	1887	481,357	2,330,706	1,377,685	571,114
United States of America	1886	12,496,744	48,033,833	44,759,314	44,612,836
	1887	13,172,936	49,234,777	43,544,755	44,346,526
	1888	13,663,294	50,331,042	42,599,079	50,501,592

¹ The figures given for Canada in 1886 and 1887 relate to the Provinces of Ontario, Manitoba, and the N. W. Territories. In 1888 the numbers for Ontario only are shown.

JOURNAL

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ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

COVERED CATTLE YARDS.

WHEN, in the year 1865, I contributed to the Journal a paper on Covered Cattle Yards, their number in the country was few, and their utility by the vast majority of agriculturists held to be very doubtful—indeed, at that time the matter had taken so little hold on the agricultural mind, and was fraught with so much misconception, that, had a plébiscite been taken for or against their use, those old enough to remember the set of current opinion will have little doubt as to what the nature of the verdict would have been.

But all that is changed now, and within the last quarter of a century few matters of agricultural practice can be pointed to in which so radical a change of opinion has taken place—the *volte face* comprising alike the landlord, the tenant, the practical man, and the theorist.

The credit of originating Covered Yards is unquestionably due to the sagacity of a few enterprising landowners; but the hundreds of such yards that now exist in the country go to show that the apathy of the tenant with respect to them has long been thrown aside, whilst a thorough appreciation of their usefulness has taken its place, with a demand, both great and widespread, for their erection.

I had much difficulty in carrying the tenant with me in the first yard I roofed over, but now, in letting a farm, almost the first thing asked is, "Will you cover the yards?" And doubtless

my experience as to this is not singular, but could be confirmed by that of many others.

On numerous large estates in different parts of the country Covered Yards are accomplished facts, and on many others the improvement is being gradually carried out, so that no special pleading is required to further the adoption of the system. Their increase now chiefly depends on the power of the land-owner to supply them, and, given this power, the choice of covering material, suitable design, and efficient construction at an economical rate, is a problem ever-recurring for solution. I do not pretend to have discovered a key to this problem, but, by illustrating the various modes of roofing now existent, detailing cost, principles of construction, and the merits of each, I hope to be able to place such data before those interested as will enable them to compare, and so to solve it for themselves.

In the construction of Covered Yards the first essential to be kept in view is to secure

Efficient Ventilation.

When this is wanting, cattle kept in them cannot thrive well, and one of the chief advantages derivable from their use is marred. The object of cover is to shelter, but not to tender, and, in order to this, plenty of air must be forthcoming, but so admitted as not to impinge on the cattle, or create draughts—both being prejudicial to their health. Experience has proved that this can be best attained by openings at eaves height of the building to let the air in, while a break high up in the roof induces a through current and draws off the heated foul air from below.

This is known as “roof ventilation” (in contradistinction to “wall ventilation,” which allows a free current of air to enter the yard over low end or side walls at a height little above that of the animals kept in it), and was an invention of the late Sir Harry Meysey Thompson, and fully described by me in the paper referred to.¹ It would be needless repetition to detail it again, but, the principle being a correct one, it will be briefly described, and a design of roof on that system given, as suitable to carry a covering of slates or tiles.

Covering Materials.

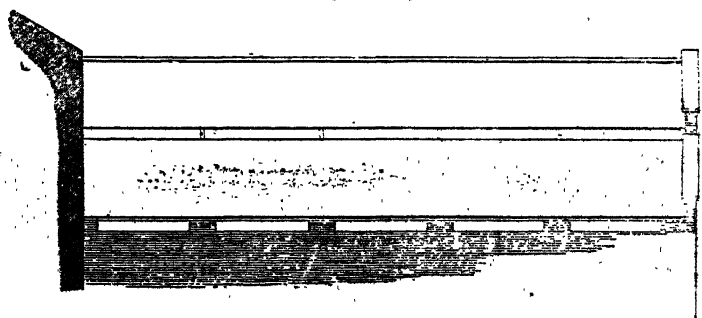
The materials used for roof-cover of Cattle Yards in 1865 were chiefly slates and pantiles. The latter have been very exten-

¹ Vol. I. Part I. 2nd Series, p. 88.

sively used in this part of the country (North Riding of Yorkshire), all the yards on the estates of Lord Zetland and other large landowners being covered with them. They form an excellent cover, and are less heat- and cold-conducting than slates. In localities where manufactured, and little carriage is involved, they are, moreover, cheaper; but of late years they have been rather at a discount, owing to the difficulty of getting samples good enough to stand the frosts of winter. Within the last few years corrugated iron and boards have also been extensively used, and Felt and "Willesden paper" partially so. The two latter I do not propose to take into consideration.

For illustrative purposes I assume a typical yard of sixty feet by forty-five feet, divided into two, and enclosed by buildings on the north and east sides, and I propose to give roof-designs suitable for covering with slate laid on in the usual way, and

Fig. 1.—*Elevation of West Side of Yard, covered with Slates or Tiles.*



with pantiles; with slates laid in a way known as open slating, with boards, and with corrugated iron, and also to give priced quantities of the work required for each.

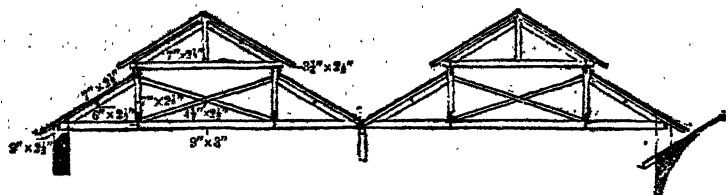
Fig. 1 is an elevation of the west side of this yard, showing the ventilating openings at the eaves and in the roof. Fig. 2 is a section drawing, and shows that the eaves openings on the west slope outwards and upwards, and tend to throw upwards the current of air entering the yard. These openings are returned round the east side: but buildings being supposed to exist here, the open spaces are got between the eaves of the two roofs, piers being built on the walls to give the necessary height to the inner one.

The air-current on these sides, it will be observed, is turned downwards; but practically little inconvenience arises from this, the adjoining roofing affording protection from anything except very strong gales and drifting snowstorms. We have

seen a cheap and simple appliance used to obviate this occasional inconvenience—viz., pieces of half-inch board, about the width of the opening, suspended from the eaves between the piers by pieces of light chain. They are dropped when a storm occurs, and afford very effectual protection, and are readily looped up again out of the way when it abates. Seldom more than one side of the yard needs protection in this way at one time.

Fig. 2 shows an ordinary queen-post truss, strong enough to carry a covering of slates or tiles. To get a ventilating opening high up in the roof, the queen posts are lengthened as shown, the clear space of a foot or fifteen inches thus obtained inducing a free current of air across the yard, and through its entire length, without any draught being felt below. The currents from the gables are obtained, as shown in Fig. 1, by leaving openings in them at the same level as the break in the

Fig. 2.—Section of Roof showing the late Sir H. M. Thompson's Mode of Ventilation, covered with Slates or Tiles.



roof and eaves openings. The spars on the upper part of the roof overhang the lower, and thus exclude rain and snow.

The above embodies the principle of "roof ventilation" referred to, of which the late inventor said that, "until he was better informed, he would take leave to call perfect." After many years of experience in the construction of Covered Yards, I have no hesitation in endorsing his assertion, and in no instance where it has been adhered to have I seen anything but the most complete success.

I will now endeavour to set out the cost of the roof shown by Figs. 1 and 2, covered with slates laid in the ordinary way, and also covered with pantiles.

Quantities and Prices of a Slated Roof on Sir H. M. Thompson's Principle of Ventilation.

Fig. 2.—(Close Slated). Fold Yard, 60' 0" x 45' 0" (inside).

Yards	Feet		£	s.	d.
—	248	run 9" x 3" framed tiebeams	@	6½	6 14 4
—	524	" 7" x 2½" framed tiebeams and rafters and king posts	"	4½	9 16 6

Yards	Feet			£	s.	d.
—	224	run framed cross braces $4\frac{1}{2}'' \times 2\frac{1}{2}''$	@	$2\frac{1}{2}$	2	6 8
—	564	„ purlins $6'' \times 2\frac{1}{2}''$	„	$\frac{3}{4}$	7	1 0
—	141	„ pole plates $9'' \times 2\frac{1}{2}''$	„	$\frac{1}{4}$	2	7 0
—	188	„ $6'' \times 2\frac{1}{2}''$ plate to top of rafters	„	$\frac{3}{4}$	2	7 0
—	94	„ $5\frac{1}{2}'' \times 1\frac{1}{2}''$ ridge	„	$\frac{1}{2}$	0	15 8
—	—	No. 40 sqrs. $2\frac{1}{2}'' \times 2\frac{1}{2}''$ common rafters	„	9	18	0 0
—	368	run $3'' \times 1''$ tilting fillet	„	1	1	10 8
—	—	No. 32 sets wrought-iron straps and keys	„	3	4	16 0
—	—	No. 4 cast-iron pillars and fixing	„	30	6	0 0
16	—	run cast-iron mid-gutter	„	$2\frac{1}{2}$	2	0 0
31	—	„ $5''$ half-round cast-iron eaves spouting	„	$\frac{1}{6}$	2	6 6
14	—	„ $3''$ circular cast-iron down piping	„	$\frac{1}{3}$	0	17 6
445	—	sup. slating with seconds Welsh grey $14'' \times 8''$ slates	„	$1\frac{1}{10}$	40	5 10
31	—	run blue Staffordshire ridge	„	$\frac{1}{3}$	1	18 9
—	20	sup. rough plate-glass and fixing	„	1	1	0 0
Cost of roof slated				£110	3	5
Cost of same roof if covered with pantiles					96	10 0

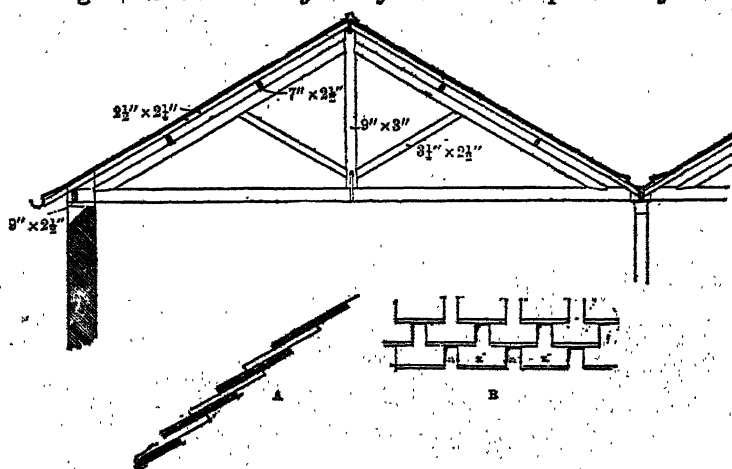
The amount 110*l.* 3*s.* 5*d.* for a yard-space of 300 yards shows the cost per yard of ground roofed over to be 7*s.* 4*d.*

The same roof covered with pantiles would cost 96*l.* 10*s.*, and per yard roofed over 6*s.* 5*d.*

Open Slated Roof.

Fig. 3 shows section of a roof-truss designed for slates to be laid in a way known as open slating. This mode of covering

Fig. 3.—Section showing a Roof covered with Open Slating.



A. Section of Open Slating. B. Elevation of Open Slating.

has been rather extensively adopted, and, with the eaves openings as shown, the ventilation obtained is fairly satisfactory.

It will be seen from sketches A and B that there is a free space for admission and emission of air between every slate, $2\frac{1}{2}$ inches wide by the thickness of the slate, which, in the aggregate, is something very considerable, and, being distributed evenly over the whole roof, there are no draughts, and is another cheap way of getting roof ventilation. The weight being much less—something over one-fourth—than in ordinary slating, the roof-trusses may be placed farther apart, thus resulting in a less costly form of structure.

Those who have yards covered in this way speak very favourably of them, and, as will be seen below, the cost is moderate, and leads one to think that, as the plan becomes better known, it will be more widely adopted.

Quantities and Prices for Roof covered with Open Slating.

		Fold Yard 60' 0" x 45' 0" (inside).		£	s.	d.
Yards Feet						
— 186	run 9" x 3" framed tiebeams (long lengths).	@	16½	5	0	9
— 258	„ 9" x 3" framed principal rafters and king posts		15	5	7	6
— 84	„ 3½" x 2½" framed struts		12	0	14	0
— 376	„ 7" x 2½" purlins		31	5	9	8
— 141	„ 9" x 2½" pole plates		4	2	7	0
—	— No. 34½ squares, 2½" x 2½" common rafters, at 16" centres		9/	15	10	6
— 47	run 5" x 1½" ridge		12	0	7	10
— 184	„ 3" x 1" tilting fillet		11	0	15	4
—	— No. 6 wrought-iron ¾" bolts		1/6	0	9	0
—	„ 3 cast-iron pillars and fixing		30/	4	10	0
17	— run cast-iron mid-gutter		2/6	2	2	6
31	— „ 5" half-round cast-iron eaves spouting and holdfasts		1/6	2	6	6
14	— „ 3" circular cast-iron down piping		1/3	0	17	6
— 40	sup. rough plate glass and fixing		1/	2	0	0
383	— slating with seconds Welsh grey slates, 14" x 8", a space of 2½" being left between each slate		1/8	31	18	4
31	— run blue Staffordshire ridge		1/3	1	18	9
				£81	15	2

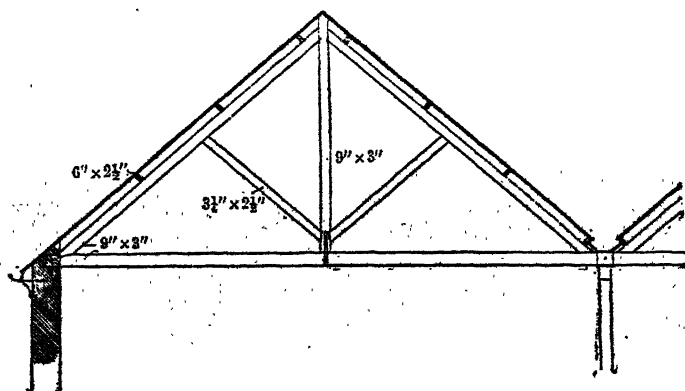
The cost of covering the yard by this mode is 81l. 15s. 2d., being at the rate of 5s. 5½d. per yard roofed over.

Board Roof.

Fig. 4 illustrates a form of roof that has obtained considerable notoriety within the last few years. It consists of a covering of boards from $\frac{1}{2}$ to 1 inch thick, laid on purlins of 7 inches by $2\frac{1}{2}$ inches, spaced from 4½ feet to 5½ feet apart. These rest on principal rafters placed from 14 to 16 feet apart, their scantling

depending on the width of span for which they are required. For ours of 30 feet, 9 inches by 3 inches is amply strong enough. For cover, well-seasoned white-wood boards—owing to greater freedom from knots—are considered best, and are more frequently used than red-wood, although it is probable that the latter for this, or any similar outside purpose, would be more enduring.¹ They are used in widths of 7 and 9 inches—the former preferable as being less liable to warp. Before the boards are laid studs are driven into the purlins at the points where the boards would have come into contact with them, and the boards resting on these studs are then securely nailed to the purlins. The object of the studs is to allow a free downward course to any wet that may permeate the roof, and prevent its lodgment on the purlins,

Fig. 4.—*Section showing a Roof covered with Boards.*



besides securing a free circulation of air between the purlins and boards, and tending to the preservation of both from decay.

The boards are laid $\frac{1}{2}$ inch apart, giving light to the yard, and also affording the means of ventilation. Grooves about $\frac{1}{2}$ inch wide, and $\frac{1}{2}$ inch from the edge, are made in them, with the object of catching the rain when blown athwart the face of the roof, before it reaches the openings, and conducting it down to the eaves spout.

A special feature of this roof is that, though the interstices give sufficient light to the yard, and air enough for good ventilation, yet the wet that finds a way through them is in

¹ Mr. Dent prefers redwood, and has used it in such of his yards as are covered with boards.

quantity extremely small—quite too insignificant to infringe on the comfort of the animals or to impair the quality of the manure kept under it—indeed, it has been proved that less rain penetrates than when close-boarding is used. This is a curious fact, and not easily accounted for—but a fact nevertheless.

The higher the pitch of the roof the sooner the rain gets off, and this tends to its preservation; but it is not well to go beyond a given pitch, as, when too high, the rain is found to enter in greater quantity. Lord Wenlock's agent at Escrick, Mr. Walker, who has erected a great many of these roofs, and particularly noted this point, finds a rise at an angle of 40 degrees to be the happy medium between a high and a low pitch. He also advocates a moderate rather than a wide span, finding the water does not get so well away on long-sided roofs than where shorter, and is more liable in strong winds to be blown through the openings into the yards.

The first to adopt it was Mr. Cundy, land-agent of Wetherby, who got the idea of its leading principle from a brickmaker, who found that his bricks were kept drier when his shelter boards did not absolutely touch than when in contact. This induced him to cover, by way of experiment, a small yard near his residence embodying the principle, which proved so satisfactory that he has gone on covering ever since, and up to the present has roofed over on the estate of Mr. Montagu and others upwards of 120. His neighbours, among whom may be named Mr. Dent, Lord Wenlock, and many others, have more or less followed his example.

That a wooden roof is a better equaliser of temperature than any of the others herein described will be readily admitted. That the Cundy roof also attains to the first essential of Covered Yards—efficient ventilation—all who have had experience of them concur in affirming; that its first cost is less per yard than any of the others the subjoined prices will show. But whether it will in the long run prove the most economical mode of cover is not so certain, and to the consideration of this I will again recur.

The following are the priced quantities showing cost of the roof:—

Roof covered with Boards.

Yard (inside) 60' 0" × 45' 0".

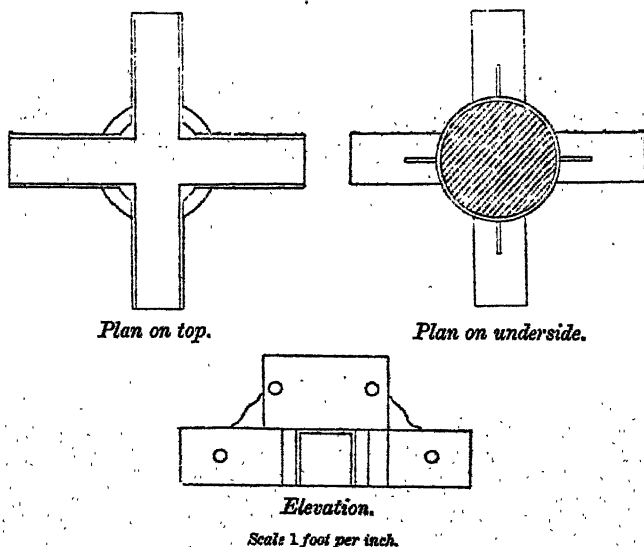
Yards	Feet								
—	124	run 9" × 3" framed tiebeams (long lengths)	.	@	1/6 1/2	3	7	2	
—	206	" 9" × 3" framed principal rafters and king posts	.		1/5	4	5	10	

Yards	Feet			£	s.	d.
—	68	run $3\frac{1}{2}'' \times 2\frac{1}{2}''$ framed struts	@ $\frac{1}{2}$	0	11	4
—	768	„ $6'' \times 2\frac{1}{2}''$ purlins	„ $\frac{1}{3}$	9	12	0
—	3,854	sup. $7'' \times \frac{3}{4}''$ twice grooved boarding, padded off purlins by galvanised-iron studs, and nailed with wire nails, per 100 feet	„ $13\frac{1}{2}$	25	1	0
—	—	No. 4 wrought-iron $\frac{3}{4}''$ bolts	„ $\frac{1}{6}$	0	6	0
—	—	No. 2 cast-iron pillars and fixing	„ $30\frac{1}{2}$	3	0	0
16	—	run cast-iron mid-gutter	„ $2\frac{1}{6}$	2	0	0
—	—	No. 6 wrought-iron intermediate band supports to same, $1'' \times \frac{1}{4}''$	„ $\frac{1}{6}$	0	9	0
31	—	run $5''$ half-round cast-iron eaves spouting and holdfast	„ $\frac{1}{6}$	2	6	6
14	—	„ $3''$ circular cast-iron down piping	„ $\frac{1}{3}$	0	17	6
				£51 16 4		

The amount of this being 51*l.* 16*s.* 4*d.*, shows the cost per square yard roofed over to be 3*s.* 5½*d.*

With reference to this, I may say that Mr. Cundy's quota-

Fig. 5.—Plan of Mr. Dent's methods of connecting post, tie-beams, and plates.



tions are much lower, ranging from 2*s.* to 3*s.* per yard, but his covering is only half an inch thick. One yard, 132 feet by 66 feet, which I saw, was covered in 1886 at a cost of 150*l.* 9*s.*, which comes out at 3*s.* 1*d.* per yard, roofed over; but he told me he got the roofing done at 28*s.* per 100 feet super., whereas, at

the present time, 30s. is a fair price for it. Mr. Dent's bailiff quoted the price of a large yard roofed five years ago in a very practical workmanlike way at 3s. 2d. Lord Wenlock's clerk of works quotes 4s. as about the cost at Escrick, but the roofs there are constructed with substantial main timbers, with the view to slating at some future time should it be found expedient, and hence the high cost. On the Duke of Cleveland's estate, a yard done in a very substantial manner, with one-inch boards, creosoted, cost 5s. per square yard roofed over. With these varied experiences it would be unwise to draw a hard-and-fast line, and say the cost is so-and-so, as so much depends on design and materials used; but this may be safely affirmed—that, with the present prices of materials and labour, to cover with best quality of $\frac{3}{4}$ -inch boards, 3s. 6d. per yard of ground roofed over may be taken as a full price for good, substantial work.

To bring the board roof into line for comparison with the others, it is, like them, debited with iron pillars, but in practice, where a double span is necessary, oak posts are invariably used as central supports. A simple, inexpensive, but very efficient way of connecting the posts with the plate and tiebeams is effected by means of a cast-iron cap fitted on top of the former, with flanges extending for reception of the latter. This was devised by Mr. Dent Dent, and was first used on his estate at Ribston, but it has been very generally copied by his neighbours.

The sketches in Fig. 5, p. 481, will show how the connection is accomplished.

Corrugated Iron Roofs.

These, within the last few years, have also had a fair share of patronage. They are quickly erected, and, for a certain time, require no attention to keep in repair. Opinion, however, varies much as to what time will elapse before such is required, and it is generally assumed that, when oxidation does gain a hold, deterioration will be rapid. A coat of paint is strongly recommended as a preservative—but this, applied biennially outside and inside, would entail a considerable burden on the tenant, and on but few of the roofs which I have inspected has it been used.

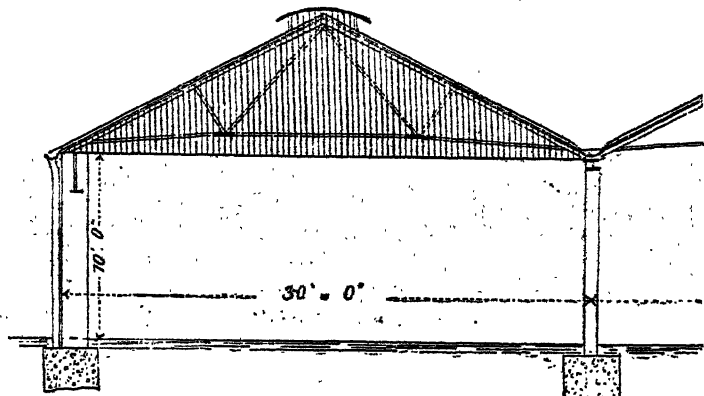
Owing to iron being a rapid conductor of heat and cold, variations of temperature are more readily felt under its cover, rendering the yards in winter cold, and in summer very hot; and I doubt if cattle can do so well under them as under roofs covered with materials of less conductive-power where the temperature is more equable. Ventilation also is usually inferior in

them. Openings in the tops of those of circular form tend to weaken the structure.

The one redeeming point which I have frequently heard advocated is their economical cost as compared with slate or tile—but that I am inclined to believe a fallacy, which will be shown later on.

Fig. 6 shows section of a roof-truss for corrugated-iron roof, with principals of tee-iron, with double-apex plates at top and shoes for foot of same, with anchor-bolts and double-joint plates, purlins of angle-iron, and astragals of tee-iron. The end principals to have framing, and the covering to be of best galvanised corrugated iron, No. 22 gauge, with circular ventilators. To have two wrought-iron columns, with self-fixing bases, rain-water gutters, and down pipes.

Fig. 6.—*Corrugated Iron Roof.*



From a firm of respectable manufacturers and erectors of iron roofs I have had a tender to supply and fix the same at a cost of 130*l*. From another firm I had, for a similar structure, a tender amounting to 140*l*. 16*s*. Taking the lowest of these tenders, the price per yard of ground roofed over comes out at 8*s*. 8*d*.

For designs of curved self-supporting roofs of best quality galvanised corrugated iron, 18 gauge, with ventilators on crown of each span, fixed complete, I had a tender of 120*l*. 10*s*., and another of 110*l*. 18*s*.; at the latter the price per yard is 7*s*. 4½*d*.

As bearing on this, I may quote the experience of Mr. Scarth, the agent to the Duke of Cleveland at Raby, who has constructed a great many of these roofs on the Duke's estates in a very com-

plete and satisfactory manner. I selected one as a fair specimen, erected on Hopewell Farm in 1888, the yard measuring 63' 0" by 46' 6", the cost of which, including plates and bolts, but without pillars, was 107*l.*; and, if we add pillars and fixing, 4*l.* 10*s.*, we get a sum of 111*l.* 10*s.*, equal to 7*s.* 5*d.* per yard roofed over. This may be taken as a fair price for work, thoroughly well done, at that date; but the rise in price of iron and labour since renders it very questionable if a roof equally good in material and workmanship could now be turned out at that price. Certainly it would not be done for less, and the price per yard, as per tender quoted, may be taken as a very moderate one.

The following is a summary of the cost of roofing the yard by the modes hereinbefore described, and also the cost per yard of ground roofed over which each mode would entail:—

Fig.	Total cost			Cost per yard of ground roofed over.	
	£	s.	d.	s.	d.
1. Slate roof on Sir H. M. Thompson's principle of ventilation	110	3	5	7	4
2. Tiled roof	96	10	0	6	5
3. Open slated roof	81	15	2	5	5½
4. Boarded roof	51	16	4	3	5½
6. Galvanised corrugated iron roof	110	18	0	7	4½

It will be seen that the first cost of the board roof is much less, and the corrugated iron somewhat higher, than any other; but the length of time each will last must be considered before conclusions can be drawn as to relative economy. Unfortunately, there is no roof of the former kind that has been long enough in existence to prove this. The age of Mr. Cundy's first roof is now about fourteen years, and as the boards show little or no sign of decay, I think I shall be justified in assuming that their period of usefulness will extend to at least twenty years, especially as they are only ½ inch thick, and those of the roof under consideration are ¾ inch thick.

The same uncertainty holds with regard to corrugated iron, and opinion varies very much as to the time it will endure, some putting it at forty years, while others who have had experience say they have found it unserviceable shortly after twenty years. So much depends on the material and mode of construction that cases might possibly be cited to prove the correctness of both statements. But as I quoted a price for iron of the strongest gauge I must also concede to it the longest term it is supposed usefully to exist.

Still, even under these conditions it compares very unfavourably with board, as the following statement shows:—

	£	s.	d.	£	s.	d.
Corrugated iron roof, first cost (lowest tender)	110	18	0			
Interest on same at 4 per cent. per annum for 40 years		177	7	6		
Repairs, $\frac{1}{2}$ per cent. per annum for 15 years on 110 <i>l.</i> 18 <i>s.</i>			7	16	3	
Total cost for 40 years				296	1	9
Board roof, first cost	51	16	4			
Interest on same at 4 per cent. for 40 years	82	17	6			
Cost of renewal of boards at the end of 20 years		25	1	0		
Interest on same for 20 years at 4 per cent. per annum		20	15	0		
Repairs, 1 per cent. per annum on 51 <i>l.</i> 16 <i>s.</i> 4 <i>d.</i> , for 15 years			7	15	3	
Total cost for 40 years				188	5	1
				£107	16	8

On the assumption that at the end of 40 years both board and iron covering are worn out, we should have a credit balance in favour of the former to the amount of 107*l.* There would be the tie-rods and framing of the iron roof as a set-off against the main timbers of the board one; but further comparison would be so hopelessly against the former that it would be futile to continue it.

Slate Roof.

The roof ranking as the next most costly is the slated one, Fig. 1. This undoubtedly is the best type for perfect ventilation of yards that I have seen, and, when a little extra cost is not an object, has much to recommend it. The following is a comparison between it and the board roof:—

	£	s.	d.	£	s.	d.
Slated roof, first cost, as per priced quantities	110	3	5			
Interest, at 4 per cent. per annum, on ditto for 40 years		176	5	0		
Repairs, $\frac{1}{2}$ per cent. per annum, on 110 <i>l.</i> 3 <i>s.</i> 5 <i>d.</i> for 15 years			8	5	0	
Total cost for 40 years				294	13	5
Cost of board roof for 40 years (as above)				188	5	1
Balance in favour of board roof at end of 40 years	£106	8	4			

At the end of forty years the position of affairs would be this:—Slate roof's requirements as to repairs, not large, but increasing; the board one, requiring a new covering, being the second. At sixty years an outlay for another sheeting of board, and possibly new purlins, would have to be met, while the repairs to the slated roof would still be on the increase.

The following statement (with balances brought forward)

will show the outlay for renewals, repairs, and interest for other forty years, and also how the balance stands at the end of eighty years:—

	£	s.	d.	£	s.	d.
Debit balance, slate roof, as above . . .	294	13	5			
Add interest, at 4 per cent. per annum, on first cost for a second 40 years . . .	176	5	0			
Repairs for 40 years, at 1½ per cent. per annum on first cost, 110 <i>l.</i> 3 <i>s.</i> 5 <i>d.</i> . . .	55	1	8			
Total cost of slate roof for 80 years . . .				526	0	1
Debit balance, board roof, as above . . .	188	5	1			
Add interest on first cost, 51 <i>l.</i> 16 <i>s.</i> 4 <i>d.</i> , at 4 per cent. per annum on second 40 years . . .	82	17	8			
Add interest on first renewal of boards, 25 <i>l.</i> 1 <i>s.</i> , at 4 per cent. per annum for 40 years . . .	40	0	10			
Cost of second renewal of boards . . .	25	1	0			
Interest on second renewal of boards, 25 <i>l.</i> 1 <i>s.</i> , at 4 per cent. per annum for 40 years . . .	40	0	10			
Cost of third renewal of boards and first renewal of purlins, at 60 years . . .	34	13	0			
Interest on third renewal, 34 <i>l.</i> 13 <i>s.</i> , at 4 per cent. per annum for 20 years . . .	27	14	2			
Total cost of board roof at end of 80 years . . .				438	12	7
				£87	7	6

We have thus at the end of eighty years a surplus balance in favour of boards of 87*l.* 7*s.* 6*d.*; but in all probability an entirely new roof would by this time be required, which would absorb about two-thirds of it. If the condition of the slate roof at this time could with any certainty be determined, the relative economies of each might be apportioned, at least approximately; but as this cannot be done we can only come to this conclusion—that, although the first cost of the board roof is less than half that of the slate, the cost of the frequent renewals renders it doubtful whether, in the end, there is any great saving effected. The chief utility of the invention I consider to be that it enables two yards to be covered at a cost at which one only could be covered by the ordinary mode of cover. This at the present day is a matter of the first importance, and enables a landlord to give the benefit of a covered yard to a much larger number of his tenants than he perhaps otherwise could have done.

Tiled Roof.

The tiled roof comes next for consideration, and compares a little more favourably with board than slate does; but it must be borne in mind that the cost is estimated on the basis of the

tiles being made in the district. If they had to be brought from any material distance, carriage would add considerably to it. The wear and tear of a tile roof is also much greater than in the case of one of slate, and a larger sum must be allowed for this. On the whole, considering the difficulty there is in getting tiles sound and well burnt, the advantage they possess over slate, except in localities where manufactured, is not great.

Open Slated Roof.

Reverting to the open slated roof, as shown in Fig. 3, the result of comparison of cost between it and the board roof is as below :—

	£	s.	d.
Open slated roof, first cost as per priced quantities	81	15	2
Interest, at 4 per cent. per annum, on 81 <i>l.</i> 15 <i>s.</i> 2 <i>d.</i> , for 80 years	261	11	8
Repairs, $\frac{1}{2}$ per cent. per annum on first cost, for 15 years	6	2	6
Repairs, $\frac{1}{4}$ per cent. per annum on first cost, for 40 years	40	17	0
Total cost of open-slated roof for 80 years	390	6	4
Total cost of board roof for 80 years, as per foregoing statement	438	12	7
	£48	6	3

Thus, whilst the board roof costs less at the outset, the charges for renewals so burden it that, by the time it has reached eighty years, an ordinary form of roof covered with spaced open slating passes it in the economical race, and probably henceforward will hold the field. For it must be remembered that at that date another board covering will be required, increasing the balance in favour of open slate to 73*l.* 7*s.* 2*d.*, approaching a sum which would very nearly renew the latter.

Those who have followed me thus far will probably not differ much from the conclusions which the foregoing inquiry enables me to arrive at, provided they agree with the premisses on which they are founded.

It is, as previously stated, a matter of uncertainty as to what age an ordinary corrugated iron roof and a $\frac{3}{4}$ -inch board roof will attain. I have certainly dealt liberally with the former in basing calculation on an existence of forty years; but, in taking the latter at twenty years, some may think I have given it scant justice.

If an extension of five years' further existence were conceded, making the life of a board roof twenty-five instead of twenty years, the situation at the end of the time to which my calculation extends would be materially modified, and the board roof would be shown to be the most economical of all, the open

slate excepted. But a few more years of experience are wanted to confirm the opinion held by many as to this, and therefore, without going to extremes, the following deductions may be fairly drawn:—

1. That, both from an economical and utilitarian point of view, corrugated iron roofs for Cattle Yards are inferior to, and least desirable of, all the modes that have come under review.

2. That a roof embodying in construction the principle of ventilation recommended by Sir H. M. Thompson, whether covered with slate or tile, and the board roof originated by Mr. Cundy, about equally balance in point of economy; but the first cost of the latter being only half that of the former, an owner adopting it is enabled at equal outlay to double the area of his roofing. Hence, in point of utility, it is greatly superior, and deserves consideration from those who yet have yards to cover.

3. That a spaced open slated roof is the most economical of any, with ventilation not so perfect as the two last named, but yet in practice found to be fairly sufficient.

ADVANTAGES OF COVERED YARDS.

Although the advantages arising from the use of Covered Yards are now generally well known, it may not be out of place to briefly summarise them here, premising that, though many writers since 1865 concur in placing them much higher than I did then, none have put them lower, and my own experience since entirely confirms what was then advanced.

The first items to note are:—

Economy of Food in conjunction with the Health and Well-doing of Stock.—Warmth being equivalent to food, where it obtains, as in a Covered Yard compared with an open one, food must be saved. The immunity from draughts and great variations of temperature, and shelter from storms and general inclement weather, which a judiciously ventilated Covered Yard affords, conduce to the comfort, health, and general well-doing of its inmates. Animals so favoured not only require less food, but render a better account of what they do consume than do those kept under contrary conditions.

The money value of these advantages has been estimated at from 6d. to 1s. per head per week during thirty weeks of winter. Although I quite believe the latter is not at all too high, I prefer to take the middle course, and say 9d., thus showing a gain of 22s. 6d. per head.

Superiority of Manure, and Economy in its Application.—Manure made in Covered Yards is unquestionably very superior

to that made in open ones. This results from two causes—concentration and conservation. In Open Yards the components of the mixture are the excreta of cattle, straw, and rain-water. Under cover the first two only are comprised in it. Moreover, as much less straw is used, the excreta bear a larger proportion to it, and especially when nitrogenous foods are used—rendering the manure, weight for weight, more concentrated and richer in fertilising matter.

And, having got this valuable manure, cover tends to its perfect preservation until the time arrives for applying it to the soil; whereas in Open Yards the results of exposure and repeated washings by rain cause great deterioration, and involve the loss of the most valuable constituents of manure.

In an experiment made by the late Dr. Voelcker he found that farmyard manure, after twelve months' exposure in an Open Yard, had lost nearly all the nitrogen and 78·2 per cent. of its soluble mineral matters. In round numbers two-thirds of the dung was wasted, and only one-third left behind. This may seem rather a startling statement to make, but Dr. Voelcker's well-known practical knowledge, and the care and accuracy with which all his experiments were conducted, entitle any conclusion he arrived at to great consideration.

In practice probably so great a loss would seldom occur, as the bulk of the manure made on a farm would not be more than eight months in the yard. Yet many practical men may be found who estimate the loss at quite one half, or, more strictly speaking, value what is made in Covered Yards at double that made in open ones. For comparison, however, I will not go so far, but may safely put the increase of value at one half—that is, if manure made in Open Yards is worth 3s. 6d., the other is worth 5s. 3d., per ton.

The quantity of manure made by a medium-sized beast in a Covered Yard during the winter months may be taken at 8 tons, which, at an increased value of 1s. 9d., gives a gain in product per head for that period of 14s.

If the above is correct, it follows that, to obtain equal results, 1½ ton of Open-yard manure must be applied for every ton of that made under cover, costing in labour half as much more, provided the conditions of application are alike. But they are not alike, for, as practical men well know, the latter may be drawn from the yard, and applied direct to the land for any description of crop. Not so the former: the large proportion of straw in its composition renders it unsuitable for direct application, more especially for turnip crops, and a cartage to heap, turning, refilling, recarting, and re-emptying are indispensable,

thus adding largely to the cost. Eightpence per ton would be a moderate estimate of the difference between the two, and this on 8 tons shows a balance of 5s. 4d. per head in favour of beasts kept in Covered Yards for the winter.

Saving of Litter.—Not more than half the quantity of straw is required for litter in a Covered Yard than is necessary in an open one, and a reduction of $1\frac{1}{2}$ ton per head of ordinary-sized cattle may fairly be calculated on. This saving may be turned to account as food, thus enabling a larger number of cattle to be kept. This is no slight matter in these days, when live-stock are, and, for many years to come, are likely to remain, the mainstay and sheet-anchor of British Agriculture.

The savings and gains accruing from the use of Covered Cattle Yards may be tabulated thus:—

	£	s.	d.
Economy of food, superior health, and well-doing of stock, estimated per head . . .	1	2	6
Superiority of manure, estimated per head . .	0	14	0
Economy in application of same, estimated per head . . .	0	5	4
Saving of litter (straw) to be used as food, $1\frac{1}{2}$ ton per head (at consuming value) . .	1	10	0
	£3 11 10		

I have, I believe, fairly estimated the cost of providing Covered Yards at the prices current of labour and materials, and hope I have not exaggerated the statement of benefits to be derived from their use.

At the present time, perhaps few ways are open to a land-owner in which he can so readily and greatly assist his tenants, whilst indirectly benefiting himself, as by the equipment of his estate with covered yards. On many estates this has been done, and my parting word to the owners of those where it has not is—lose no time in effecting a work that ranks so high in the list of farm economy, which, judiciously carried out, will prove a lasting benefit to the tenants, tend to an enhanced value of property, and thus become a sound investment of capital.

W. J. MOSCROP.

THE SEED AND ITS GERMINATION.

PERHAPS no process in the life history of a plant is invested with more interest than its reproduction, and of all its members none is more singular than the seed—the structure which is

the link between the old and the new individual. Springing from the one, it contains within itself the germ of the other, a germ which, though partially developed, is yet dormant, and may remain so for a time almost indefinite in its duration. Yet, though dormant, it possesses life, and changes of which we know nothing may be taking place in its substance. After a certain time, the length of which varies extremely, changes in its environment may, and do, bring about changes in its inner vital condition, which lead to the resumption and perfection of the development which was begun while it was still connected with its parent, but which was afterwards suspended till the onset of germination.

The seed of a plant is thus essentially the new individual, not quite indeed at its starting point, but developed only so far as to show within itself the several features of the plant—the representatives of stem, leaves, and root. It is furnished with a mass of reserve material, which will be utilised on the resumption of active life. The essential properties of a seed are all comprised in these two factors—the resting rudimentary plant or *embryo*, and the food materials which the latter will by-and-by require.

The mode of distribution of these materials is by no means uniform in seeds, and a distinction between two main kinds is usually made. In the one the skin, or *testa*, as it is called, is found to contain the embryo only, which is then usually of large size. Such a seed we find in the common pea or bean. If it be freed from its testa and dissected, we can observe the young root curling over a fleshy mass, which is easily separable into two parts symmetrical with one another (see fig. 1). These fleshy masses represent the first leaves, and are known as the *cotyledons*, or seed-leaves. In such a seed they are the storehouses of the reserve materials, and their consistence is due to the masses of these which are deposited in their substance. Between them, when they are gently forced apart, can be seen the rudiment of the young stem. All leguminous seeds (clover, sainfoin, lucerne, vetches, &c.) and all cruciferous seeds (turnip, rape, cabbage, kale, mustard, radish, &c.) are of this type.

Other seeds show an additional structure present besides the embryo and the testa. The embryo is in them found to be embedded in a mass of homogeneous-looking material, which may be floury, or fleshy, or even horny in its consistence. This is technically known as the *endosperm* or *albumen*, and is a

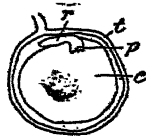


Fig. 1.—Seed of Pea dissected.

c, cotyledon; r, radicle, or young root; p, plumule, or young stem; t, testa.

development of cellular tissue in the interior of the cell in the ovule in which the embryo or young plant originated. This *albumen* must not be confounded with another substance known as *albumin*, which will be referred to later on. To avoid confusion it is best to speak of it as *endosperm*. When present in a seed it contains the reserve materials, and the embryo itself which is embedded in it is usually small, though its separate parts are as complete and as well recognisable as those of the larger embryo of the pea or bean. This form of seed is found

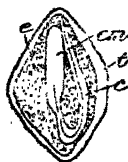


Fig. 2.—Seed of Buckwheat in section.

t, testa; e, endosperm; em, embryo, consisting of axis and two cotyledons; c, the latter folded back.

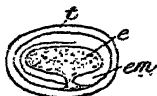


Fig. 3.—Seed of Beet in section.

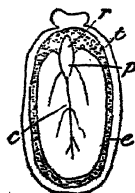


Fig. 4. Seed of Castor-oil Plant dissected to show Embryo.

(4) surface view of latter; (5) section at right angles to (4); t, testa; r, radicle; p, plumule; c, cotyledon; e, endosperm.



Fig. 5.

in the buckwheat, potato, carrot, parsnip, onion, beet, mangel, &c. (figs. 2, 3, 4, 5).

According to the presence or absence of this endosperm or albumen, seeds are often spoken of as *albuminous* or *exalbuminous*. Thus, the seeds of buckwheat, potato, &c., are albuminous; the leguminous and cruciferous seeds are exalbuminous.

In the grasses and cereals, which are so important to us as a source of food supply, a still further modification of the albuminous seed is met with (fig. 6). Part of the embryo develops into a curious shield-like body, which is placed so as to separate the young plant from the endosperm. This body, which is known as the *scutellum*, is covered on the side facing the endosperm by a peculiar, delicate coat, which has a very important part to play in the processes of germination. Besides possessing this scutellum, the embryos in grasses and cereals differ from those hitherto mentioned in having only one cotyledon, or seed-leaf.

This, then, is the state of things in the seed: a young plant resting and quiescent, but surrounded by, or filled with, nutritive matters, and possessing the power of responding to a suitable stimulus, usually that of moisture and warmth, by a resumption of active life and growth.

The several parts mentioned can be very readily recognised

with no further appliances than a small knife and a needle or two. The dissection is very simple, and may be effected without the assistance of a microscope. To display the parts of the common bean it is advisable to soak one in water for twenty-four hours, when it will be found to have swollen up slightly, and to be easily manipulated. At one end of it will be noticed a black patch (the *hilum*) which marks the place at which it was attached to the pod. If it be carefully pressed a minute drop of water will be squeezed out of it, close to the part of this patch which is next to the broad end of the bean. This indicates a small opening in the testa or skin, through which when the seed was young the tube or outgrowth from the pollen grain entered it to fertilise the germ cell. This opening is technically known as the *micropyle*. If now the skin be carefully slit open and peeled off, the whole of its cavity will be found to be occupied by the embryo. The great mass of this consists of two large fleshy lobes which are pressed face to face, but do not adhere together. These are the cotyledons (fig. 1, *c*). Joining these cotyledons together will be found the rest of the embryo, which consists of an axis, showing at the one end a root or radicle (fig. 1, *r*) lying outside the cotyledons, and pointing towards the micropyle, and at the other the rudimentary stem (fig. 1, *p*) which is folded inwards, and so lies hidden by the cotyledons. This can only be seen when one cotyledon is removed.

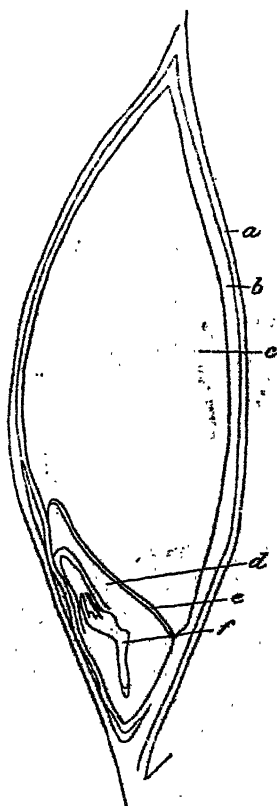


Fig. 6.—Section of Grain of Barley.

a, palea; *b*, pericarp of grain; *c*, endosperm; *d*, scutellum; *e*, epithelium of scutellum; *f*, embryo.

Another seed which should be dissected is that of the buckwheat. This is a triangular seed with sharp angles. The so-called "seed," as we find it, is really the fruit, which is hard and dry. The black outer skin is the wall of the fruit or the pericarp. With a little care this can be removed by a sharp knife or a stout needle—more easily if it has been soaked for a time in water. Inside is found the seed with a thinner, more

delicate testa, which shows a mark or hilum at its base or broad part. This hilum is the point of attachment of the seed. The micropyle is present in this seed as in the former case, but, instead of being near the hilum, it is at the apex of the seed. If the testa be now carefully removed, it is seen to have covered a mass of white matter. Cautiously scraping this with a needle, it will be found to enclose a yellowish body placed rather to one side of it. This is the embryo. It is smaller proportionately than is that of the bean, and the cotyledons, instead of being thick and fleshy, are thin and leathery, and are rolled round part of the floury white matter. The latter is the endosperm. A section through the buckwheat seed is shown in fig. 2.

In the castor-oil seed the embryo is situated in the middle of the endosperm, and the cotyledons are flattened out. The seed has a very brittle testa, which can be picked off piecemeal. After removal of this, the seed may be split in two by a cut along its sides, when each half will show a cotyledon adhering to a mass of endosperm. A section in this plane is shown in fig. 4, and another at right angles to this in fig. 5.

The barley or wheat grain is not easy to dissect, because its testa cannot readily be removed. The testa of the seed and the pericarp of the fruit are adherent together, and the endosperm is closely attached to the rind so formed. After soaking, however, a section through the grain will show the relation of the parts. If a wheat grain be examined, there will be found on the convex side, at the base of the grain, a small brown spot or patch of oval shape. This indicates the position of the embryo. A clean section through this spot, in the direction of the furrow in the front of the grain, will bring to light the features described above, but the parts are too small to be identified without the aid of a microscope. An enlarged drawing of a grain of barley so dissected is shown in fig. 6.

The resumption of activity involves a call upon the reserve materials to furnish the necessary pabulum for the development of the body of the embryo. Before its growth was arrested, the parent plant was the source of such supply, but now it is severed from the parent, and dependent only on itself. In later life it can lay its environment, or surroundings, under contribution, but as yet it has no organs available for this work.

In the seed, whether in the endosperm or in the embryo itself, these reserve materials are found in what are called cells. The whole of the structure, embryo and endosperm alike, is made up of a large number of these bodies, some extremely simple in structure, others considerably modified, as in the covering of the scutellum. A vegetable cell of the simplest

kind is generally polygonal in shape, and consists of the following parts: (1) A cell wall, or limiting membrane, which separates it from its neighbours; (2) a layer of living substance or *protoplasm* which lines the cell wall; (3) a central cavity or *vacuole*.

In young cells the cell wall is uniformly composed of cellulose, which is a material somewhat like starch in composition. It is homogeneous, transparent, capable of a certain amount of stretching, and possessed of some degree of elasticity; capable also of permeation by water. The protoplasm, being the living constituent, is the essential part of the cell, and carries out all the vital processes. Besides lining the cell, it often extends across from side to side, forming bridges or bands, thus dividing up the vacuole or cavity into smaller spaces. In it is embedded, somewhere in its substance, a peculiar body called the *nucleus*. The protoplasm is like the cell wall in being expansible and somewhat elastic, but differs from it in the degree of its permeability. Though water can pass through it readily, different substances in solution in the water cannot do so with the same freedom. It has a very important function, therefore, in regulating the passage of various substances into and out of the cell. The central cavity contains a fluid

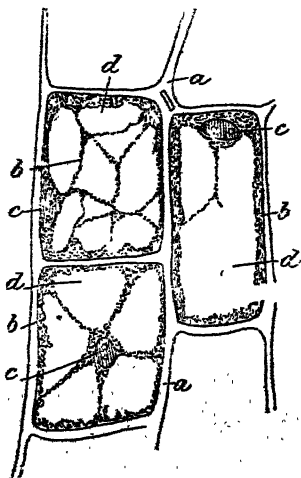


Fig. 7.—Three typical Vegetable Cells.

a, cell-wall; *b*, protoplasm, arranged partly as a circumferential layer, and partly in bands crossing the cell; *c* nucleus; *d*, vacuole, containing cell-sap, known as the *cell sap*, which is composed of water holding in solution many different substances, as inorganic salts, sugar, colouring matters, vegetable acids, &c. By virtue of the pressure it exerts, it keeps the protoplasm in contact with the cell wall. The importance of the peculiar behaviour of the protoplasm just spoken of is evident when we reflect that, if it were freely permeable, the constituents of the cell sap could be easily washed out of the cells by prolonged soakage. Fig. 7 shows three vegetable cells.

In such cells as these the nutritive materials for the use of the embryo are stored. All the different kinds of foodstuff which the living protoplasm requires for its nutrition and growth are represented here, though in different proportions in different

plants. Carbohydrates, such as starch and sugar, fats, and the peculiar nitrogen-containing material known as *albuminoid*, or preferably as *proteid* substance, which are the matters necessary for the nutrition of the animal body, are found to be equally essential for that of the embryo of the plant. Prepared and elaborated from simple inorganic materials by the parent, they have been stored away in certain of these cells before the offspring separated from it. The most commonly occurring body met with here is starch (fig. 8). This is deposited in the form of definite grains, the shapes and sizes of which vary with the plant in which they are found (figs. 9, 10, 11). Many of them show

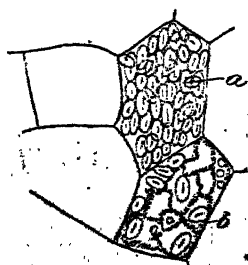


Fig. 8.—Cells from Endosperm of Wheat.

a, crowded with starch grains; b, after removal of most of the latter. The protoplasmic network is now visible.



Fig. 9.

Starch Grains from (9) Potato, (10) Wheat, (11) Maize.



Fig. 10.



Fig. 11.

a concentric striation, as if they were built up by the deposition of layer after layer upon a much smaller central mass. Chemically these starch grains are composed of two substances, one, called *granulose*, being much more soluble than the other, which, from its resistant nature, is known as *starch-cellulose*. These two substances are intimately associated together in each layer of the starch grain, so that the granulose can be removed by appropriate solvents without interfering with the shape of the whole structure.

Another body of the carbohydrate class is characteristic of some seeds, notably of the different varieties of palm. The cells contain no starch, but the whole seed is composed almost entirely of cellulose. The walls of the cells are enormously thickened, and their cavities are proportionately reduced in dimensions. They then contain only amorphous nitrogenous matter, with sometimes a certain amount of oil, as in the coconut palm.

The albuminoid matter, or proteid, is often found in the

form of definite grains, which in the simplest cases show no structure. In the lupin (fig. 12) and other leguminous plants they are embedded in a matrix of protoplasm, from which by certain solvents they can be separated, leaving a coarse network of protoplasm behind (fig. 13). In other cases, as in the seed of the castor-oil plant, the grains of proteid are very

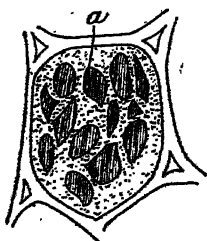


Fig. 12.

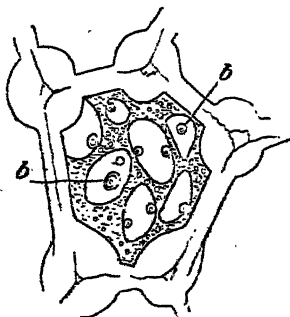


Fig. 13.

Two Cells from Cotyledon of Lupin.

(12) with unaltered aleurone grains, *a*; (13) after treatment with sulphuric acid. This has dissolved the aleurone grains, and has left the protoplasmic network visible. *b*, drops of oil.

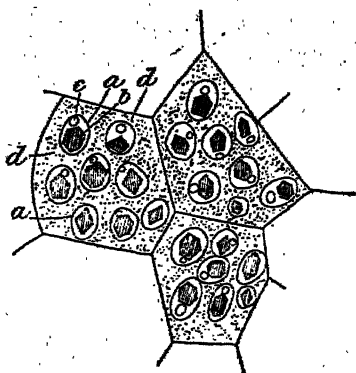


Fig. 14.—Three Cells from Endosperm of Castor-oil Seed.

a, aleurone grains, containing, *b*, crystalloid and, *c*, globoid; *d*, meshwork of protoplasm.

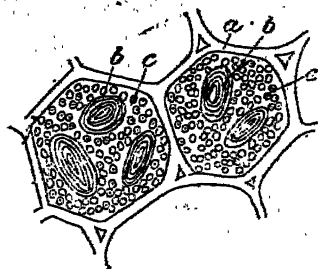


Fig. 15.—Two Cells from Cotyledon of Pea.

a, cell-wall; *b*, starch grains; *c*, aleurone grains.

complex (fig. 14), consisting of an ovoid mass of granular appearance, in which are embedded a crystal-like body with well-defined edges, and an aggregation of mineral matter, chiefly a double phosphate of calcium and magnesium. These masses of proteid matter are generally spoken of as aleurone grains. In

other cases, as in the palms just mentioned, proteid matter is found not in grains, but in an amorphous form.

These proteid reserve materials differ from all others in one very important respect. They contain nitrogen, which is an essential constituent of living substance.

Some seeds—e.g. the pea—contain aleurone grains in the same cells as starch grains (fig. 15); others have the two restricted respectively to separate cells.

Fat or oil is usually found saturating the protoplasmic or proteid network in the cells. Some seeds contain a very large proportion of this, the castor-oil plant, for instance, yielding 50 to 60 per cent. of the dry weight of the seed. Hemp seed contains about 32 per cent. The pea, on the other hand, has not more than 2½ per cent. Generally, where oil is abundant starch is absent, though all three forms of reserve material may be present in the same seed.

These substances—starch, proteid, fat—are all much alike in their insolubility in water. They resemble each other, too, in not being capable of what is called dialysis, a physical process on which much of the interchange of material in a plant depends. If a solution of sugar be placed in a vessel whose bottom is composed of parchment paper, care being taken to see that there is no pinhole or other aperture in it, and this be then floated on a vessel of water, it is found that soon there is a stream of water passing through the membrane in the direction of the sugar, and there is also a stream of sugar solution, though less in amount, passing through to the water. This goes on till the liquid on both sides of the membrane is of equal concentration. Sugar in this experiment is shown to be capable, when in solution, of passing through such a membrane. If, instead of sugar, a solution of proteid matter, such as white of egg, be placed on one side of the membrane while water is on the other, it is found that the egg albumin is unlike the sugar in behaviour and cannot pass through to the water. Sugar is dialysable; albumin is not.

This process of dialysis or diffusion is of great importance in the plant, as it is by virtue of it that the reserve matters are taken up from the endosperm by the embryo, and, indeed, that food material generally is caused to pass from cell to cell within the latter. If there be an accumulation in one cell of any material capable of dialysis, a stream will set in between it and the contiguous cell till both are equally saturated, and so the accumulated material will be gradually dispersed throughout the embryo, its ultimate course being guided by the consumption of it at some definite point.

On submitting seeds to the influences favourable to the process of germination, of which moisture and warmth are the chief, the embryo or young plant is found to grow and develop, while the reserve materials disappear *pari passu* with such growth. The problem involved in germination is, therefore, to convert the insoluble and indiffusible materials, stored as described in the cells, into such related forms as are capable of being dissolved in the water or sap which permeates the germinating seed, and are also capable of passing through the walls of the cells. The latter we have seen to consist of two parts—a cellulose limiting layer, and a lining of protoplasm in close approximation to this. Materials capable of passing through the former are not necessarily able to pass the latter also.

This problem is very much like the one which we meet with in the animal organism, when we consider the way in which the materials which the latter takes in as food are converted into forms suitable for absorption into the tissues of its body. The food which is thus taken consists of compounds belonging to the same classes as the reserve materials of the seed, and, as its ultimate end is the same—viz. the nutrition of the living substance—it seems likely that the processes of digestion and assimilation will be very much alike in the two cases. In the case of the animal organism it has long been known that the necessary changes are brought about through the agency of peculiar bodies known generally as *unorganised ferments* or *enzymes*. Such are the pepsin secreted in the stomach, the starch-transforming body (ptyalin or diastase) found in the saliva, and the similar one occurring in the secretion of the pancreas. Another well-known instance of a body of this kind is the *rennet* which can be extracted from the mucous membrane lining the stomach of the calf, and which has the property of converting the casein of milk into curd or cheese.

What a ferment is exactly is not at present known; the only proof it gives of its existence is its activity. Certain characters, however, which all ferments have in common may be briefly summarised as follows: (1) They are present in very minute quantities. (2) Their activity depends upon their being exposed to a certain limited range of temperature. (3) They are totally destroyed by a high temperature, such as that of boiling water. (4) They do not become changed or destroyed by their activity. (5) They do not themselves enter into the composition of the bodies which they produce. (6) Their activity is much impeded, and at last stopped, by the accumulation of the products of their action. The mode of their action seems to be to cause a disruption and rearrangement of the

molecule of the body they attack, with the assumption by it of water. Thus starch, the molecule of which may be represented for purposes of illustration by the formula $C_6H_{10}O_5$, under the action of the ferment of saliva is transformed into sugar, whose molecule is $C_6H_{12}O_6$, the two differing by a molecule¹ of water, H_2O .

Though these ferments have long since been demonstrated to be the active agents in digestion in animals, their existence in the vegetable kingdom has only within recent years been proved, and even now comparatively little is known as to many of them. It has, however, been ascertained that germination is a process which is mainly set up by them and is dependent upon their working. It is, in fact, the process of digestion, and assimilation by the seed, of the food materials deposited within or near the embryo. We will examine the processes of this vegetable digestion and absorption separately, dealing with the three great classes of foodstuffs—carbohydrates, proteids, fats—one by one, taking for discussion in each case a plant which shows it most easily.

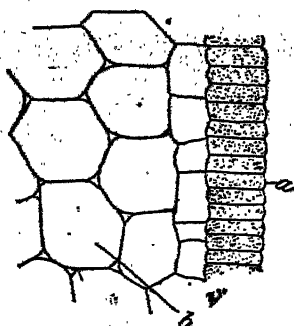


Fig. 16.—*Epithelium and subadjacent Cells of Scutellum of Barley (c in Fig. 6) × 250.*

a, epithelium; b, subadjacent cells which in life contain aleurone grains.

The carbohydrates, as they are called—starch, sugar, and cellulose—form the first group, and their transformations can be studied best in the grasses and cereals, of which we will consider barley as the type. The details of the germination of this plant have been recently worked out by Messrs. Brown and Morris.

The grain of the barley has already been described. A section of it is shown in fig. 6, p. 493. The embryo is separated from the endosperm by a peculiar shield-like expansion, the scutellum, which is covered by a delicate coat. The microscope shows this coat to be formed of a layer of cells which are columnar in shape (fig. 16), their

¹ A molecule of any substance is the smallest quantity which is able to take part in or result from a chemical change, or to exist in a free state. Molecules are made up of atoms. The molecule of starch is thought to be composed of six parts or atoms of carbon (C), ten atoms of hydrogen (H), and five atoms of oxygen (O), or of some multiple of this quantity. This is represented by the formula $C_6H_{10}O_5$. The molecule of water is made up of two atoms of hydrogen and one of oxygen, and is expressed as H_2O . The change effected by the ferment—viz., the transformation of starch into sugar—may be expressed shortly by the equation $C_6H_{10}O_5 + H_2O = C_6H_{12}O_6$. Probably the decomposition is not so simple as this.

narrow ends resting on the cells of the scutellum. They have a length of about $\frac{1}{800}$ to $\frac{1}{600}$ inch. The endosperm is pressed closely upon this layer of cells, and consists of a mass of cells with thin walls, their interior being packed full of starch grains (fig. 8). Examination of the germinating barley seed by the aid of the microscope shows that the first process that takes place is the swelling up and dissolving of the walls of the cells of the endosperm in which the starch is contained. This solution begins always immediately under the cells covering the scutellum, and extends gradually throughout the endosperm. The structure thus becomes friable or mealy, owing to the starch grains being set free from the constraint of the cell walls. A little later the starch grains are attacked—again immediately under the scutellum. The grains become pitted on their surfaces, and the pittings increase gradually and become deeper, so that the grains are irregularly broken up (fig. 17).

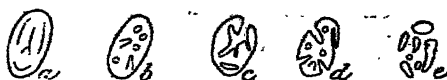


Fig. 17.—Disintegration of Wheat Starch by Diastase.

a, b, c, d, e represent successive stages.

The disintegrated starch grain then becomes dissolved, the starch being converted into something soluble in water, which we shall see later is a form of sugar.

Both these processes have now been ascertained to be due to the action of unorganised ferments. The one which causes the disruption of the starch has long been known under the name of diastase. The second has only recently been discovered by Messrs. Brown and Morris. These investigators have shown that both the ferments take their origin in the layer of cells which have been described as coating the scutellum, and which they consequently have called a secretory epithelium (fig. 16, a).

The starch and cellulose so disappearing are found to be replaced by certain forms of sugar, and the process is no doubt one of conversion of the former into the latter, just as is the case in the digestion of starch by an animal. This can indeed be proved by preparing a solution of the ferment from the germinating barley and acting with it on a quantity of starch in a test-tube. To carry out this experiment it is necessary to dissect out the embryos from a number of germinating grains, and grind them up with a little water containing a trace of chloroform, the latter being used to prevent the growth of micro-organisms or bacteria in the solution. The mixture must then be allowed to stand for a day, when it can be filtered. There results a clear liquid which contains the ferment or diastase. On mixing this with a certain quantity of thin starch

paste, containing about one per cent. of starch, and exposing it to a temperature of about 104° Fahr., the starch gradually vanishes, and the mixture is found then to contain a quantity of sugar proportionate to the starch which has disappeared.

The changes in the cellulose are not capable at present of such absolute proof. The ferment can be prepared in a similar way, and its solution will dissolve cell walls. If a thin section of a piece of potato be immersed in such a solution, in a few hours the walls of the cells are found to become swollen and gradually to dissolve. A piece of filter paper, consisting of cotton fibre, which is composed of cellulose, is found to be affected similarly, though more slowly. But at present the nature of the resulting product has not been fully ascertained, though there is little doubt that it is again a form of sugar.

That these changes, brought about by extracts of the germinating grains, are due to the ferments thus prepared is shown by the fact that the solutions lose their power of action if they are subjected to a high temperature, a phenomenon we have seen to be one of the peculiarities of unorganised ferments.

In both cases we have thus the transformation of an insoluble and indiffusible substance into forms which are soluble and diffusible, the same process in fact which we call digestion in an animal organism.

More than that, there is evidence that the sugars thus produced are materials upon which the young embryo feeds. Messrs. Brown and Morris have fully established this point by dissecting out young embryos, whose growth has just recommenced, and feeding them on solutions of the different sugars. They absorbed these and continued to grow and to develop, much as when left surrounded by their endosperms. The process of absorption of the nutritive matter was found to be carried out by the same epithelium of the scutellum, which thus is seen not only to be secretory in function, but absorptive as well. The utilisation of the cellulose in the seeds of palms also depends upon an epithelium covering the absorbing organ, which in this case is a part of the cotyledon. The details are not yet, however, fully understood.

The way in which the absorbed carbohydrate becomes part of the actual substance of the young plant we will discuss after we have considered the changes in the nitrogenous reserve materials and the forms in which these also are absorbed.

The nitrogenous reserve materials have already been described as existing very largely in the form of definite bodies known as aleurone grains. These have been investigated in greatest detail in the lupin and a few other leguminous seeds.

The nitrogenous material which is found in both animal and vegetable organisms is usually termed *proteid*, a word which has superseded the older term "albuminoid material." *Proteid* exists in several forms which differ from one another in behaviour. Several great classes of *proteid* matters have thus been recognised, the albumin of white of egg, the globulins of blood and muscle substance, and the casein of milk being representatives of some of these.

Albumin¹ is soluble in water; globulins are soluble in water to which a little neutral salt, such as sodium chloride, has been added; casein requires the presence of a little alkali. Albumins and globulins have the peculiarity of being changed by heating into a very insoluble form known as coagulated *proteid*, which can only be dissolved by strong acids and alkalis. Another class, known as "albumoses," has a peculiarity of its own, in that a solution of an albumose is precipitated by the addition to it of a drop of nitric acid, and the precipitate dissolves on heating the tube, appearing again as it cools. All these various forms, showing different degrees of solubility, agree in being incapable of diffusing through a membrane in the manner already described. There is another class which differs from all the others in being soluble in water, and in being capable of this diffusion. This is known as *peptone*. It is found most readily in the digestion of nitrogenous or *proteid* matter in the stomach of an animal, being in fact the form in which such *proteids* are absorbed in gastric digestion.

The aleurone grains in the lupin are composed of a mixture of two of these *proteids*, an albumose and a globulin. The lupin, being an exalbuminous seed, stores the aleurone in grains in the cell of the tissue of the cotyledons, which are large fleshy structures exactly like those of the pea or bean (fig. 1). Before germination commences the grains have sharp well-defined outlines, and can be seen to lie embedded in a network of protoplasm or living substance (figs. 12, 18). In space they take up about half of the cell. When germination begins they swell slightly as if they were absorbing water, and their enlargement causes the network to become compressed (fig. 19). Retaining their spherical shape, they begin then to lose the definiteness of their outline, and become studded with granules (fig. 20). They appear in fact to be dissolving from within outwards. The process of dissolution proceeds till they entirely disappear, leaving the cells occupied by the network of protoplasm only (fig. 21), which, now that the contents are expelled, is seen to

¹ This must not be confused with the term *albumen*, formerly used to indicate the endosperm—see page 492.—(ED.)

be comparatively loose and to contain large cavities filled with cell sap.

The process of dissolution is not, however, as at first sight it seems to be, one of simply dissolving the aleurone grains in

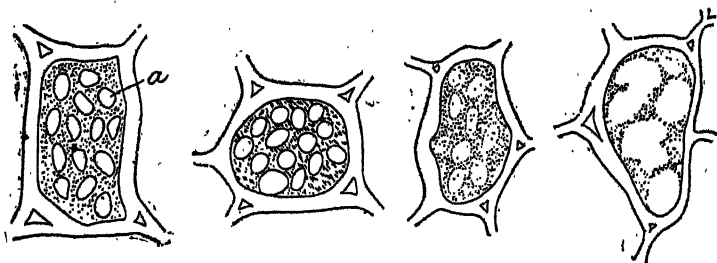


Fig. 18.—Cell from Cotyledon of Lupin before commencement of Germination.
a, aleurone grain^s.

Fig. 19.—Cell from germinating Lupin, taken when Germination is just commencing.

Fig. 20.—Cell from Lupin, taken when Germination is progressing. The Aleurone Grains are disappearing.

Fig. 21.—Cell from Lupin at a later stage than Fig. 20. The Aleurone Grains have disappeared.

water absorbed from outside. The proteids of the lupin are almost insoluble in water, the greater part being a globulin, and the rest a mixture of albumoses. They are all incapable of diffusing or dialysing through a membrane. Yet, as they do disappear and pass out from cell to cell, it is evident that they undergo a transformation into a diffusible form.

As in the case of the carbohydrates, we find on investigation that we have here again a process of digestion due to the action of another ferment. The germinating lupin seed, when extracted with weak solution of common salt, or with glycerine, in which most ferments of this kind are easily soluble, has been found to give up to the solvent the active principle in question, which has the power of dissolving hard-boiled white of egg, or muscle substance, or other proteid material. When this has disappeared into solution, it has been found to have been converted into peptone, the diffusible proteid described above, which can be separated from the solvent with considerable ease.

The first product of the working of this ferment is evidently peptone; but peptone does not appear in any amount in the growing plant, so that its formation is the first stage only. A new crystalline substance can, however, be extracted with facility and in some quantity. This is asparagin, a peculiar acid body containing nitrogen, which crystallises from its watery solutions in beautiful rhombs of considerable size. This results in the

lupin from a further decomposition of the peptone under the influence of the same ferment. It can be traced about the young plant, and can be shown to travel along its tissues up towards the seats of active growth.

The appearance of this crystalline body at the expense of proteid is not a phenomenon peculiar to vegetable life. Precisely similar decompositions are brought about in the intestines of animals. In the stomach a great part of the proteid matter of the food is converted into peptone and absorbed into the blood; part, however, goes on into the intestine, where the secretion of the pancreas or sweetbread meets it. This contains a ferment which brings about changes which resemble those of the lupin seed, the proteid being converted first into peptone and then into crystalline bodies called leucin and tyrosin. These are both nitrogen-containing bodies and correspond to the asparagin of the plant. They all belong to a group known to chemists as "amides."

The ferment in pancreatic juice which brings about this transformation is known as *trypsin*, and that of the lupin seed may therefore be called *vegetable trypsin*.

There is a peculiarity about the ferments which digest proteids that is less noticeable in the case of those which affect carbohydrates, which is that they require some other medium than a neutral one for their activity to be manifested. The vegetable trypsin works most energetically in a faintly acid one, and cannot change the proteids at all if the fluid be alkaline. Observation of the seed during germination shows that its sap is neutral at first and soon changes to a faintly acid reaction.

A very marked difference between the barley and the lupin appears with regard to the distribution of the ferment in the seed. In the former, this has been shown to be confined to the scutellum, and to a particular layer of cells in this. In the lupin, on the other hand, there is no such limitation. The ferment is distributed throughout the substance of the cotyledons, wherever the reserve proteids are stored. The difference in distribution involves a difference of procedure. In the barley the ferment is formed continuously in the epithelium of the scutellum, and thence is poured out, or extruded in some way, into the endosperm. In the lupin it is formed once for all in each cell where the reserve materials are accumulated.

The germination of the seed of the castor-oil plant (figs. 4, 5) throws light on the general question of the fate of the oil or fat which is found in variable quantity in so many seeds. As said above, the quantity present in the castor-oil seed may amount to nearly 60 per cent. of its dry weight. It is on account of its

great richness in oil that this seed has been selected as the most suitable for research. The cells of its endosperm contain a number of aleurone grains, which are more complex in their nature than those of the lupin, for each has inside its ovoid body a crystal or crystalloid of proteid matter, and a small globular mass of mineral nature, the globoid (fig. 14). The digestion of these proteids proceeds on almost exactly the same lines as in the case of the lupin. The matrix of the protoplasmic matter in which these aleurone grains rest is saturated with the oil, so that this latter does not occupy spaces in the interior of the cells as the cell sap does. This appears to be the way in which fatty matter is generally stored. There is no starch or other carbohydrate in any appreciable quantity laid up in the castor-oil bean, so that the reserves are only proteid and oil. Generally in seeds where oil is very abundant this is found to be the case, though when there is but little oil starch also may be present.

In such a seed as this, then, the oil must take a large share in the nutrition of the embryo, and being a highly complex body it gives rise to a very elaborate series of changes before the food for the young plant is made suitable for its absorption.

In composition, fats are made up of a combination of fatty acids, such as stearic or oleic acid, with glycerine. By various means, especially by subjecting them to the action of alkalis such as caustic potash, or by distilling them with super-heated steam, this combination can be broken up, and the glycerine and fatty acid can be separated from each other. This is the decomposition which is brought about in the manufacture of soaps, which are the bodies formed when fatty acids are made to combine with oxides of metals, the most familiar ones being the soda and potash soaps.

The first decomposition which can be traced in the germination of the castor-oil bean is this liberation of the fatty acid from the glycerine. If a germinating seed be treated with a little very weak soda solution, and the extract filtered, the latter is found to contain a soda soap, which can be decomposed by the addition of a little mineral acid such as sulphuric, when the fatty acid separates out as a curdy precipitate. The acid is insoluble in water, while the soap, like all soda soaps, is soluble. This fatty acid is a thick, greasy fluid, which is incapable of dialysing through a membrane such as parchment paper or cell wall.

The decomposition is effected in the seed by the agency of another ferment, which, like the tryptic one, exists in the endosperm of the resting castor-oil bean in the condition of a zymogen.

If the seed be watched during germination, it is found that in its cells other changes go on besides this preliminary one. After about five days of development the young embryo has attained considerable size, its primary root protruding for about two inches, and bearing a number of secondary rootlets of variable length. The cotyledons of the seed remain inside the endosperm, which has become swollen, and contains a quantity of water. It is through the cotyledons that the food material is absorbed. The endosperm contains at this period a certain quantity of the unaltered oil, some fatty acid, another acid which can be separated out by soaking it in water, and which is then capable of crystallising; also a quantity of sugar. Of these, the sugar and the new acid body are the only ones which can be absorbed by the process of diffusion. At a still later period, when the reserve materials of the endosperm are almost exhausted, the only constituents left in the cells are the crystallisable acid and the sugar. It is evident, therefore, that besides the decomposition of the oil into fatty acid and glycerine, further splitting up leads to the transformation of these into the newly appearing bodies mentioned. The glycerine resulting from the first action is changed almost immediately it is formed, no observers having been able, indeed, to prove its presence in the cells in a free state. From many considerations, which need not be entered into here, it is inferred that it is the source of the sugar which is found. Glycerine has been ascertained by Messrs. Brown and Morris to be capable of nourishing isolated embryos of barley almost as well as solutions of sugar itself. The fatty acid, again, which disappears from the endosperm as the germination advances, gives rise to the other form of acid, which is found to be capable of dialysing. Both these, *i.e.* the sugar and the new acid, can be traced into the young plant.

There is no ferment present which can produce these later transformations. A very curious fact is, however, noticeable, which shows how the changes can take place. The endosperm of the castor-oil plant retains a power which that of the barley does not. It is capable of a certain amount of development and growth apart from the presence of the embryo. In the barley this power is quite absent—the endosperm does not change at all if the embryo be dissected out. This capability of independent growth in the castor-oil endosperm indicates a certain amount of life dormant in the cells. In all seeds the endosperms have at first been living, and evidence of their life has been afforded by the deposition of the reserve materials in their cells, for each cell regulates its own internal concerns. In the young seed before maturity we have a living embryo surrounded

by a living endosperm. In the exalbuminous seeds the embryo absorbs the contents of the endosperm before the resting period, and the endosperm disappears. In the case of the barley the endosperm cells fill themselves with starch and other products, but this is their last effort. The endosperm of the castor-oil plant accumulates aleurone grains and oil in its cells, but after the period of rest it can resume the activity which it possessed before, and initiate the changes of germination. The living substance thus remains in these cells in a condition which it does not maintain in the cells of the barley, where active life, when germination commences, is confined to the embryo, which secretes the ferments in the cells forming the epithelium or coating of the scutellum. This activity still residing in the protoplasm of the endosperm of the castor-oil seed explains the later stages in its germination. The ferments are formed in the matrix of protoplasm; by one of them the oil is decomposed into fatty acids and glycerine. Besides giving rise to the ferments, the protoplasm is the seat of other chemical activity, processes of gentle oxidation and reduction taking place there as long as it is living. By such processes the fatty acid and the glycerine are transformed into the crystalline acid and the sugar. The barley grain, then, contains a living embryo surrounded by a store of reserve food materials, which can be called into the nutritive processes only by the action of the embryo, which has, in fact, to secrete the ferments necessary for the digestive processes. The castor-oil bean contains a living embryo, but the surrounding tissue of the endosperm not only stores the food for it, but retains the power of transforming that food into the forms needed by the embryo, and supplies it ready for absorption. By the action of the ferment it splits up the fat or oil; by the further activity of the protoplasm of the cells it transforms the fatty acid and glycerine into an acid and a sugar which are capable of passing through the walls of the cotyledon and so entering the young plant.

These changes comprised in germination are set up only when the seed is exposed to moisture and warmth. Why is it necessary thus to wait? Why should not the changes in the reserve materials follow at once on the maturity of the seed, and so cause the growth to go on without any resting period? The answer to this turns on the condition of the ferments in the resting seed. If these were in an active condition there, as they are in the germinating seed, there would seem to be no reason for the suspension of activity. But an extract of the seeds of the lupin before germination begins, whether made with water, salt

solution, glycerine, or any other neutral solvent, is found to be quite inert towards proteids, and an extract of the resting seed of the castor-oil plant cannot decompose the oil. The ferments, in other words, do not make their appearance till germination begins, and the commencement of this process is really dependent on their development. From what, then, do they arise?

The condition of things is more easily ascertained in the resting castor-oil seed than in that of the lupin. If an extract of this seed, found on experiment to be quite inert, be warmed for an hour or two with a little very weak acid, the ferment power makes its appearance in the solution. Again, if the seeds be extracted at a temperature of about 86° to 104° Fahrenheit by a faintly acid solution of this kind, an active preparation is at once obtained. The ferment is in the cells of the seed, but not in an active condition. To put it in other words, the seed before germination contains in its cells something which, though not the active ferment, can be readily transformed into it by warming with a little weak acid. To this something, which can be extracted from the resting seed as easily as the ferment can be from the germinating one, the name "mother of ferment," or *zymogen*, has been given. The resting seed, therefore, differs from the germinating one in containing zymogen instead of ferment, and the onset of germination is brought about by the conversion of the former into the latter. To the conditions to which the seed is exposed when sown we must look for the explanation of this conversion. The reaction of the resting seed is neutral, that is, it is neither acid nor alkaline, whilst the contents of the cells are dry. The earth in which it is sown is moist, and water is soon absorbed by it. This absorption of water is a necessary antecedent to germination. Water gaining access to the cells sets up changes in the living substance, in consequence of which certain vegetable acids are formed. The change in the reaction of the seed from neutral to faintly acid can be easily seen. The vegetable acids so formed convert the zymogen present in the cells into the active ferment, and at once the conversion and transportation of the nutritive materials towards the seats of growth or of absorption set in.

In these various ways, then, the young embryo is fed. The reserve materials are in all cases transformed from the insoluble indiffusible condition in which they are deposited into soluble diffusible forms that enter its tissues in order to enable the embryo to proceed in its development. Their further fate is to undergo changes of a reverse order, the living substance growing and increasing in amount thereby. This process, constituting

indeed the nutrition of the plant, is not yet understood at all completely. The efforts which have been made to trace the formation of protoplasm, or even of proteid, from the simple forms absorbed, have been neither so complete nor so successful. Certain advances, however, have been made. The tissues of the young plant show, on careful examination, the progress of various forms of matter towards the seat of active growth. Growth, or rather the formation of new matter, is in plants very largely localised in particular regions. The apex of a root or of a shoot is such a part; a particular region in some stems, known as the cambium layer, where are formed the new cells which increase the diameter of such stem, is again the seat of this construction. Towards these regions, particularly towards apical growing points, both sugar, vegetable acids, and asparagin, with other allied amide bodies, can be proved to travel. But at the growing points themselves no sugar and no amide can be detected. There, in the growing cells, the secret of the construction of living substance is hidden. A certain amount of light, though really very little, has been thrown upon the formation of that curious material we have called proteid by the study of these parts when furnished with one or more of these travelling supplies. When lupins are grown from seeds in darkness their tissues are found to be charged with asparagin. Their growth only proceeds for a time. If now they are removed into the light, and supplied with air, the asparagin disappears, and their bulk again begins to increase. It has been inferred from this that the construction of proteid demands the presence of carbohydrate, such as sugar, and an amide body, such as asparagin. When these are supplied to a living cell, and at the same time traces of sulphur, and perhaps phosphorus, are present there as well, proteid is constructed under the influence of the living substance of that cell. From the proteid so formed the living substance itself is built up by processes as yet unknown. The cessation of growth in the darkness is due to the non-supply of the carbohydrate, as the plant can only form this in the light. From the living substance itself we have the formation of the other bodies found in cells—cell-wall, or cellulose, being always secreted from it. Starch also has been found to need the intervention of protoplasm before it can make its appearance.

Though the constructive side of the growth of the young plant thus leaves much to be inferred, the process of germination is now to a large extent understood, a very great advance in our knowledge having been made in recent years. So far from the process involving nothing more than the transformation

of starch into sugar, it is seen now to include most elaborate chemical changes in which all classes of food materials are concerned. We know now that the food of the embryo of a plant is as complex as that of an animal; that besides starch, it may comprise very many kinds of carbohydrates; that nitrogen-containing matter or proteid is an absolutely essential constituent of it, occurring in some form in all seeds; and that very many plants accumulate various fats or oils for the same nutritive purpose. We know that, however varied are the accumulations of these reserve food-stuffs in different seeds, all contain proteid, with either carbohydrate, or fat, or both. We see, too, that a complex process of digestion of these reserves of food takes place during the germination—that the long-known transformation of starch is but one among many similar changes, all leading to the supply of material to the young plant in forms which it can absorb and use. The conversion of starch into sugar is indeed at once the simplest and most straightforward of all the transformations which take place. We find, again, that diastase, the longest-known of the vegetable ferments, is but one of a large number upon whose activity the germinative changes depend.

The embryo then finds itself provided for by its parent—shielded from the adverse influences of its environment, if such there be, by being wrapped up in a strong protective integument; situated in the midst of plenty of nutritious material, and furnished in itself with all needful powers of calling these supplies into active use as soon as changes in its environment supply to it the necessary stimulus to its development and growth. The whole process of germination, indeed, is one which is strictly comparable with that which goes on constantly in the animal body—viz. digestion, and the absorption of the products of digestion.

J. R. GREEN.

FARMING IN DEVON AND CORNWALL.

TRAVELLERS, who form their opinions of local agriculture from the hurried glimpse obtained from railway or other carriage windows, would arrive at very opposite conclusions about the farming of Devonshire according as they travel by one or other of the great lines of railways which traverse that county.

The Great Western line, after crossing the eastern border a few miles below Wellington, traverses for the greater part of its

course southwards and westwards a succession of small but rich pastoral valleys, which, clothed as they are with luxuriant herbage, and studded with fine spreading timber trees, present to the traveller's view rich scenes of picturesque beauty and of agricultural prospects which are unsurpassed in any other county. As Carrington the Poet says:—

Ever varied too
Is the rich prospect. Valleys softly sink
And uplands swell. No level sameness is seen,
While in the distance, happily disposed,
Sweeps round the bold Dartmoor.

Below Exeter, and after passing in close proximity to Dawlish, and sundry other of the favourite winter resorts, the line runs, on its way to Plymouth, through the South Hams portion of the county, a district which is frequently, and not inaptly, termed the "Garden of Devon." This district extends from the foot of the Dartmoor range of hills to the southern shores of the county, and is estimated to cover an area of about 160,000 acres. For richness of soil, and general agricultural features and aspects, there are few better districts in the kingdom, nor can a more pleasing picture of rural beauty and serenity be imagined than that of a South Hams village with its thatched roofs and "cob" chimneys—"daughters of thatch and stone and mud," as John Woolcott (Peter Pindar) calls them—peeping above the foliage and branches of the surrounding orchards.

The South-Western Railway, as it runs from Axminster, low down on the south-eastern boundary, through Exeter and past Crediton on its journey to encompass the northern and western sides of the bleak and hilly Dartmoor (an area of 250,000 acres), traverses a somewhat similar district until Yeoford Junction is reached, when suddenly the prospect changes, and a most complete contrast comes into view. The rich yellow of the buttercups in the luxuriant water meadows of the valley of the Exe gives place to that of the gorse, which is so indicative of poverty in the soil. The appearance of warmth which the red soil, overlying the old sandstone, imparts to the picture visible eastwards, gives way to the grey and cold sterility of undrained clays, whilst the broad and superabundant banks in the valleys have but miserable substitutes in the district where their shelter seems most needed. All signs of comparative agricultural success (all success in agriculture is but comparative nowadays), or of application of capital to the development of the inherent capabilities of the soil, are absent except in a few rare instances, where laudable native enterprise has struggled against natural

disadvantages, and has, as it were, created so many oases in a veritable desert. It would perhaps be unkind or impolitic to inquire whether the returns in these cases bear any reasonable proportion to the outlay, but the pluck and enterprise displayed in them deserve a better reward than appearances suggest, or have too rarely been found to arise from a corresponding outlay on more responsive land.

Beyond this effort to prevent visitors to the recent Plymouth Show carrying away impressions that Devonshire land and Devonshire farming is either all good or all bad, according to their vision of it *en route*, the writer does not purpose attempting any description of the physical or geological features of the two counties. Time and space at command will not allow of it, to say nothing of the impossibility of a comparative stranger forming any adequate idea of the varied features of so extensive a district from a mere cursory and superficial inspection, incident to the assessment of the relative merits of 17 farms, entered for competition for the prizes offered by the Plymouth Local Committee, in connection with the Royal Meeting of 1890.¹ Besides, are not those features already very ably described in the Prize Essays on the farming of the two counties which appeared in Vols. VI. and IX. of the First Series of the Society's Journal? Preference will therefore be given to pointing out the changes which have taken place in the practice of agriculture in the two counties since those reports were written, and to describing the special features of the systems at present in vogue.

AGRICULTURE PAST AND PRESENT.

Mr. Henry Tanner in his Prize Essay in 1848, published in Vol. IX. of the Journal, was especially severe upon the management then followed in Devonshire. He described the course of husbandry pursued as "in many particulars very defective." The rotation called the Old Devon Course, then "too much in general use," was represented "as scarcely showing one good qualification," but whilst "combining all that should be strenuously avoided" was a "complete check to agricultural improvement." "The neglect of cleanly cultivation" was the cause of the "produce of the county being far below what the fertility of the land and geniality of the climate were calculated to secure." "Little attention was devoted to the management

¹ The detailed particulars of the systems of farm management adopted by the successful and commended competitors for these Prizes must of necessity be reserved for future publication.—[Ed.]

of farmyard manure," and "its soluble parts were allowed to find their way unchecked to the nearest watercourse." "Lime, if bought," was in many cases "not judiciously applied," and one common method of its application "only required to be noticed for its inconsistency to be admitted." The practice of Denshiring (abbreviation of Devonshiring), namely paring and burning, was pointed out as likely "ultimately to impoverish the soil," and "its evil was" said to be "seriously increased by too limited an application of farmyard manure" subsequently. Even the manufacture of cider was described as "very imperfect and uncertain," and in one respect as "very defective in its discrimination." "Little worthy of notice" was said to be "observable in the general management of the grass land," and, "despite the inducements held out to him," the farmer of the period "rarely benefited himself by the employment of his ready resources for irrigating meadow land." The paragraph headed "Grass Land" wound up with the following significant remark:—"If the agriculturist of Devon would rightly estimate the means at his disposal, and could be led to their better application, his private interests would be benefited and the public welfare promoted." The "careless mode of breeding cattle" adopted at the time "removed all hope of immediate improvement," and the advantages of sheep-farming were "not duly appreciated." The landlords did not escape censure; for the farm buildings of that day were described as "in the majority of cases very irregularly and badly constructed," and a good homestead was "rarely to be met with in any part of the county." The latter appeared to have been "built without any regard to uniformity or convenience," and their lowness and "imperfect ventilation gave rise to various diseases." The yards offered "every facility for the escape of liquid manure," although in many instances "a trifling outlay would have remedied the defect." It was asserted to be "absolutely necessary that the existing buildings should be superseded by others of more complete character before the farming of the county could make any great advance towards improvement." The restrictive nature of many of the leases "compelled the tenant often to act contrary to his better knowledge," whilst the "stringency of the conditions" was "no protection against injudicious management." "Want of security" for the tenant's outlay "prevented him improving his land," and "led to his limiting his expenditure to such a sum as would yield only a return for his own maintenance."

Thus all classes connected with the management of land—landlords, agents, tenants, and even the Legislature—came in

alike for their share of blame for the then neglected state of agriculture in this picturesque county.

Mr. Karkeek, in Vol. VI., was hardly less severe on the farming of Cornwall, though he commenced by saying that "it was in a transition state, passing from a slovenly course of husbandry—though by very unequal and incomplete degrees—to a better one." Good management was admitted to "exist on some large farms, but it was a very rare case to witness anything approaching it on very small ones." The management of hay was condemned because of the "grass not being cut until far too ripe," and the crops were described as "miserable in the extreme." The culture of the arable land did not escape censure, whilst the pastures were described as "little better than half weeds," which could not be eradicated except by "recourse to the pernicious practice of burning." "Cattle were not properly fed," but kept in a "half-starved condition in the yards and lanes in the winter," whilst "oilcake had scarcely been seen by one farmer in a thousand." In no part of Cornish farming was "greater neglect exhibited" than in the breeding and rearing of horses. The equine "stock was generally bad," and its produce was a "weedy trashy race too light for either riding or driving;" and if the young colt "did happen to be tolerably perfect when introduced into the world, it was generally rendered useless by the Cornish system of rearing." Unfortunately there were "far greater numbers of badly cultivated farms than good ones," and on the generality of soils the one breadth of green crop in the rotation was "not sufficient to counteract the exhausting effect of the three previous corn crops." Many of the "bad methods of farming" were attributed to the conditions of management laid down in the leases; whilst the practice of "not limiting the number of successive corn crops to less than two" (in some cases three were allowed) was naturally commented upon unfavourably. The writer anticipated a "hundredfold greater improvements" if the landlords, one and all, would "adopt a better system in their leases." Large farmers were by "bad management ruining their farms and themselves at the same time."

Not very flattering pictures these! But they were drawn nearly half a century ago, and "much has happened since." Agricultural education has greatly advanced—the extensive showyards of the "Royal," and their smaller reflections in the efforts of local Societies, have led to improvement in the breeding and rearing of stock of all kinds, and to the invention and use of economical machinery and implements. A spirit of enterprise and emulation has been roused which has resulted in greater advances in agricultural management than any amount of advers

reporting could have accomplished. The change also that has taken place in the relative profits from corn and stock farming has led to less attention being paid to the former, and more to the latter; whilst the introduction of artificial manures, and the cheapening of feeding stuffs, has taken much of the sting out of the objection to successive corn crops on the same land.

The conversion of land agency into a distinct profession, for which special training is now necessary, and its separation from that of the lawyer, has resulted in a freer and more judicious expenditure of capital on the part of the landlord, and has led to a more liberal, because less restrictive, dealing with the tenant in regard to the cultivation of his land, and to the provision of compensation for unexhausted improvements.

The old system of leases for lives—generally three—formerly in force in these two counties, was responsible for much that was complained of, as it took from the actual owner all interest for the time being in the substantial and efficient maintenance or improvement of his property, whilst it induced the leaseholder, or copyholder, to confine his outlay within the narrowest possible limits. This system has died out to a very great extent in regard to farms, but still appertains to houses, cottages, and small enclosures off wastes and common lands in the mining districts of Cornwall.

Since the publication of the reports referred to, and in particular since the establishment of Improvement Companies, the landlords of the two counties have spent considerable sums of money in the erection of buildings, the drainage of land, and other improvements. The following statement, provided from official sources and by the kind help of the secretaries of the different companies, will show the extent to which the advantages and assistance of these companies have been appreciated by some of the Devonshire and Cornish landlords:—

Name of Company	Sums advanced for			Total
	Buildings	Drainage	Other Improvements	
	£	£	£	£
Land, Loan, and Enfranchisement Co.	72,973	5,759	6,971	85,702
Lands Improvement Co.	69,138	17,833	28,196	115,167
General Land Drainage.	—	50,000	—	50,000
West of England	—	37,706	—	37,706
Public Money Acts	—	51,504	—	51,504
Total				£340,079

This total, large as it is, is very far from representing the actual expenditure, because various owners, or landowning

bodies, such as the Duchy of Cornwall, the Ecclesiastical Commissioners, the Duke of Bedford, Sir Massey Lopes, and a host of others, have out of their own resources done much to redeem their class from the charges of neglecting to provide their farms with sufficient substantial and well-arranged homesteads. Evidences are everywhere apparent of a considerable expenditure in recent years on buildings and improvements of all kinds, and in particular on the erection of comfortable and healthy cottages. As usual, the best and most convenient homesteads are to be found on the larger properties, whilst in North Devon, and certain parts of Cornwall, where small ownerships are found, the sanitary arrangements are sadly defective.

GRASS LAND.

The following figures obtained from the Agricultural Returns will show how large has been the percentage of land laid down to permanent grass during the last twenty years, as well as the effect of the extension of the period during which grasses under rotation are left unbroken:—

	DEVON.				CORNWALL.			
	1869.		1889.		1869.		1889.	
	Acres Returned.	Percent-ages.	Acres Returned.	Percent-ages.	Acres Returned.	Percent-ages.	Acres Returned.	Percent-ages.
Corn Crops . . .	302,114	29.98	252,513	20.94	151,077	30.79	132,777	22.23
Green Crops and Fallows . . .	191,137	19.24	148,211	12.29	89,856	18.32	60,781	10.16
Clovers, &c., in Rotation . . .	115,054	11.39	198,010	16.43	105,835	21.57	184,777	30.92
Permanent Pastures . . .	398,210	39.44	606,981	50.34	143,835	29.32	219,340	36.69
Totals . .	1,009,515	100.00	1,205,715	100.00	490,603	100.00	597,675	100.00

It will thus be seen that, instead of one half as in 1869, quite two-thirds of the cultivated lands are now in grass, either as permanent pasture, or under the process of a rotation. Much land has been seeded down with permanent mixtures, whilst, so favourable are both soil and climate to the growth of grass, many fields which were originally seeded down for a short period only, have been allowed to remain unbroken so long that they may now be reckoned as permanent pastures. In not a few instances leas on the competing farms were pointed out as due for breaking up in the coming autumn, which, had they been situated in certain other parts of the kingdom, their owners, and even

their occupiers, would have been most reluctant to disturb, so well were the clovers and grasses in them holding and thriving. The need for root crops was, however, pleaded as a sufficient reason for turning over such excellent herbage.

In view of recent controversies, it may be stated that, speaking generally, it was found that in the three to five years' leas the rye-grasses and perennial clovers had maintained their hold, and that by the end of that period the natural grasses had come up in sufficient abundance to form a sward which was satisfactory and good enough for continuance. Apparently, all those mixtures of seeds had done best in the second, third, and fourth years, in which cocksfoot and timothy had been included; whilst, on the other hand, in some of the new leas the red and other clovers had not maintained their hold—partly because the land had become "clover sick" from too frequent sowings on short rotations, and partly because nitrate of soda had been used, and the usual results had followed. In one particular field the presence of lop grass (*Bromus mollis*) in large proportions was clearly attributable to the too free use of this exhaustive stimulant. On the other hand, to the infrequent use of lime in Cornwall, due to the absence of limestone in the county, and to the consequent high cost of it in its calcined form, may be attributed the comparative failure of the clovers there in the second and subsequent years.

Of natural herbage there seems no lack, either of kinds or of goodness, in the two counties. Trefoil, for instance, is quite indigenous, and makes its appearance early in most leas, although little or none of its seed may have been intentionally sown. Wherever the clovers and grasses had failed, or been killed by too heavy a crop of corn, there for a surety was the trefoil to be found springing up naturally and abundantly. Crested dogtail and sweet vernal also come up most naturally, and with such constancy that their conspicuous presence in the five-year-old leas might be taken as a certain indication of the period during which the land had been seeded down. In the old pastures, cocksfoot, dogtail, and yarrow are generally to be found in large proportions.

But, on the other hand, in both the old and new pastures, particularly in Cornwall, there is far too much of that veritable weed which, on account of its liability to ergot, is frequently charged with producing abortion, viz., Yorkshire Fog (*Holcus lanatus*). The prevalence of this grass in leas, both young and old, points to the suspicion that its seed had been too often an adulterant in the mixtures sown. Too much care and precaution against the sowing of this weed cannot be taken now that

leas are left down for extended periods; and the farmers of the two counties would do well to have samples of their seed mixtures carefully and minutely examined by some competent botanist before risking the sowing of this and other adulterants. One other common and predominant weed to be found in the old pastures of the two counties is *Carduus arvensis* (one might almost add *Devoniensis*, so thoroughly does it seem at home there). It would be unkind to mention the number of times that the word "thistles" appears in the notes on the farms, or how frequent were the variations (to prevent monotony) in the terms used to express their presence. But there the plants undoubtedly were—true indexes of the depth and natural richness of the soil—and despite professed efforts to keep them down by mowing and otherwise.

ARABLE LAND.

The rotations now mostly followed are (1) mangel, (2) wheat, (3) barley or dredge corn, (4) roots, (5) oats, (6) seeds; or (1) mangel, (2) wheat, (3) roots, (4) barley, (5) seeds; but in sundry instances variations are made on the same farm in accordance with the kind and quality of the soil, and its suitableness to the growth of any particular crop. In most cases the seeds are left down three, four, or five years, or more, according as they retain their virtues. About half the acreage under green crops is in swedes and common turnips; one-fourth is under mangel, and the remainder is equally divided between cabbages and potatoes. Mangel and cabbage seem especially to thrive in all parts, and get more liberal manuring than any other crop.

The chief item in the above rotations which differs from the practice of other counties is the taking of a root crop (either mangel or turnip) in immediate succession to lea—or, in other words, as the first crop in the rotation. This is a remnant of the old Devon course, and is certainly the only one worth retaining. In former times, when this course (so strongly condemned by Mr. Tanner) was in vogue, the growth of three corn crops in immediate succession resulted (as it assuredly would nowadays) in the leas which followed the last of them being very soon little else than mere weed beds. The intervention of a root crop for the purpose of cleaning the land became a necessity, and even this was preceded by paring and burning of the surface sod as the easiest and most effectual method of destroying the shallow-rooted weeds. But this practice of growing three corn crops in succession has mainly died out.

although one instance at least of its existence came under notice. A second corn crop, without the intervention of a root crop, or fallow, is also rare nowadays, except where, under high farming, a better sample of barley is thereby obtainable, or where dredge corn (oats and barley mixed) is grown for home consumption.

Against the first of these exceptions (barley in immediate succession to wheat) very little is to be said, because of the general admission that the practice results in many districts in the production of a finer and more profitable sample of malting barley. But the same plea hardly holds good in the case of dredge corn, because quantity rather than quality is the chief criterion of utility in the feeding-stuff grown for home consumption. The advantage of this latter practice is therefore a very questionable one, especially when the fact is taken into account that the previous cleaning of the land for the root crop was an expensive operation, and that its benefit may thus in a measure be thrown away. As a proof of this, it may be mentioned that it was found on the farms on which the practice of taking two successive corn crops was followed that the land so cropped was invariably less clean than where the practice did not obtain. Thus, whilst the causes which led to root crops taking precedence in the rotations have disappeared, the practice itself has continued, and is now mainly advocated because of its allowing more root crops during the rotation.

The preparation of lea land for a root crop may be thought a somewhat expensive process, but the extra cost is locally considered to be repaid by the intervention it allows of an extra root crop, and the consequent additional opportunity it affords for cleaning the land. The mode of preparation is as follows:

In the autumn, or early winter, the land is "skirted," i.e. partly skim-ploughed. Alternate strips of the sod, about $1\frac{1}{2}$ inch in depth and 6 inches wide, are ploughed over on to the adjoining strips which are not severed from the soil. This inversion of one half of the sod on to the other leads to the decay of both, and renders the work of its subsequent disintegration an easy matter. It lies thus for some weeks until the cultivator, or "tormentor," as it is locally called, is worked across the lines of the previous skirting once or twice, or oftener, as may be found necessary. This is followed by heavy or chain harrows to break up the old sod and make its strongest portions ready for picking and burning. In some districts, and especially in Cornwall (where there are few stones large enough to interfere), the next process is "shaving" or hoeing by an extraordinary implement, 4 to 5 feet wide, strongly resembling a large Dutch hoe on wheels, which upsets all surface weeds that may have sprung up from seed since the previous harrowing. Then follow the harrows, and, when all the rubbish has been picked off, the farmyard dung is applied, and ploughed in with a deep furrow, and not unfrequently by a digging plough. The land is then rolled and harrowed until reduced to a sufficiently fine tilth for drilling, which latter is done on the flat by a drill which sows both artificial manure and seed at one and the same time.

The processes of cultivation for all other crops are much the same as in other parts of the kingdom, though they rejoice in local synonyms which may at first be somewhat puzzling to strangers to the provincial dialect. To hear that a field was first "skirted," then "tormented," "shaved," "combed or chiselled," "broken," and "seeded," is but to grasp very imperfectly that it has undergone the various operations of skim-ploughing, cultivating, horse-hoeing, harrowing, ploughing, and drilling. It may be mentioned that all root crops, potatoes, cabbage, &c., are almost invariably drilled or planted on the flat, and that the corn crops are not often drilled, and still less often hoed or weeded. Also that in general the management of the root crop is superior to that of the cereals, with the result that, whilst in the Produce Statistics issued by the Board of Agriculture the estimated ordinary average yields of the former approach very closely to the mean of the whole kingdom, those of the latter are the lowest of any county in either England or Scotland.

South-western farmers are not heavy feeders of stock, nor can they be said to indulge too largely in the purchase of artificial manures. To many graziers and stock-rearers in other counties the expenses of Devon and Cornwall farmers for purchased feeding-stuffs would, with but one or two exceptions, seem mere trifles, whilst the bills for artificial manures are rarely of sufficient amount to lead to contested arbitrations under the Agricultural Holdings Act.

WATER MEADOWS.

Water meadows are a great feature in the farming of Devonshire. Wherever a stream, be it small or large, runs alongside or through any grass land, there is it sure to be utilised for irrigation. The water is conveyed in open gutters or carriers along the different lines of contour, and from them distributed over the land below; and, if a small village or town happens to pour its sewage undiluted into the stream, the land below reaps the benefit. On many farms a stream of water is diverted purposely through one corner of the homestead or yard, so that the liquid manure from the foldyard and buildings can get into it, and be carried with it to some adjoining meadow. This may be, and doubtless is, a very economical method of applying the liquid manure; but when, as in too many instances seen, the pond or reservoir in the farmyard, which is used for collecting and mixing the two fluids, is made a drinking place for cattle, there can be no wonder that occasionally animals do badly, despite all other care in housing and feeding. The usual period

for irrigation is from November to April, the water being allowed to run a week at a time on different parts of the meadow. The beneficial effect of the irrigation is very apparent, and results in an early growth of grass, which is of great value in early spring for ewes and lambs, and for flushing the milk of cows.

FRUIT FARMING.

Much land, especially in Cornwall, is devoted to the growth of strawberries and other small fruits; also potatoes, broccoli, and other vegetables and flowers for the early markets of our large towns. During 1889 the Great Western Railway conveyed some 300 tons of strawberries, 4,500 tons of new potatoes, and 8,000 tons of broccoli from the two counties. The South-Western Railway also conveyed its share, whilst other large quantities were sent by water to the various seaports.

The earliest and best strawberries and other fruits are grown on the banks of the Tamar, which divides the two counties, and are forwarded thence to London, Manchester, Edinburgh, and other large centres. Latterly, raspberries, gooseberries, and other bush and tree fruits have been largely grown in the neighbourhood of Penzance, St. Erth, and Marazion, the latter the oldest town in Cornwall. The cultivation of the tomato by the aid of a cold frame has been introduced since this vegetable came into such popular favour. Some enterprising gardeners have of late taken, with much success, to growing grapes and peaches in hothouses for sale in London and other large towns.

It may be worth mentioning here that a few years ago caterpillars were very prevalent in the district referred to, and did much damage to the gooseberry bushes; but a dressing of hellebore boiled in water and syringed on to the bushes effectually destroyed the insect. The writer's informant bought his hellebore on that occasion by the ton, and found it a most effectual expenditure.

VEGETABLE FARMING.

In the neighbourhood of Penzance and around Falmouth many acres of the earliest potatoes are grown, and are followed by early cauliflower and broccoli, all of which find their way to distant markets. On the outskirts of the little fishing village Mousehole, and its neighbour Paul or St. Pol, there are numberless small gardens—mere beds they might be called, so small are they individually—which are devoted to the growth of these crops.

Wherever along the slopes of the coast between Penzance and Land's End there is any soil overlying the rocks, no matter

if it only extends to a few yards, it is cultivated for these early crops, and a most pleasing sight it is, when sailing along the coast, to view these efforts to make so unpromising a surface productive.

These plots of cultivated ground are subdivided by tall fences, chiefly of elder (because of its rapid growth), for the purpose of shelter from the rough weather from the south-west. In many instances these fences when running north and south are but three or four yards apart, in some instances even less, but at the east and west ends they are at much greater distances. They thus make the enclosures long and narrow, with their greatest lengths open to the south. Early maturity is the sole object aimed at, as, unless the potatoes can be the first of the English crop in the market, they cannot be made remunerative. The shallowness of the soil, adverse as it is to the growth of heavy crops, is conducive to this early maturity, whilst not infrequently the tendency of a deep or rich soil to delay maturity is checked by an artificial admixture of sea sand. Sea-weed is the chief manure used, though nitrate of soda, sulphate of ammonia, kainit, and other artificials, to the extent of as much as a ton per acre, have of late years come into favour, whilst guano has gone out because of the uncertainty of its quality. Where stable dung can be obtained it is preferred to all others.

Planting begins generally with the New Year with sets which have already sprouted, care being taken not to injure the sprouts when handling or planting them. The sets are planted very close and shallow, and in rows less than a foot apart. No earthing up or hoeing is done, and when the crop is being lifted a flat and long-handled spade is used which does not penetrate the ground more than two and a half to three inches in depth. In a small field close to Penzance some thirty hands (men, girls, and boys)—part of a lot of one hundred engaged for picking green gooseberries for jam—were seen filling up their time in lifting and sorting a crop of potatoes. They worked in gangs. One man lifted the plants and tubers and placed them on vacant ground alongside the row. A boy then took hold of the stalk and shook the tubers from it. Two others (or girls) picked up such of the potatoes as were visible and spread them on the site of the row previously removed, whilst another boy with iron rake followed to stir over the soil, and a fifth and last one gathered up the extra tubers thus exposed. Other hands followed and sorted the potatoes, putting the largest together in barrels, and the small ones, "seconds," into others. Carts were in waiting to convey the barrels to the station or quay. The crop was estimated to produce 8*l.* to 10*l.* per acre.

After the crop had been removed the land would be harrowed, and cauliflower and broccoli plants put in as soon as rain had come.

ORCHARDS.

The cultivation and management of these is an important element in the farming of certain portions of the two counties, though it does not receive that general care and attention which it deserves. Pitiable, indeed, is the state of many of the orchards, with their fences broken down, pruning neglected, trees full of dead wood and quite hoary with the growth of lichen and moss, with other evidences of neglect too numerous to mention. Yet in many individual instances the pecuniary returns from orchards form a material portion of the profits of the farm.

The Devonshire Pomological Society has, since its foundation in 1884, done something to bring about a better state of things. It has drawn attention to the recognised best sorts of apples and pears, whilst its shows, at which 12,000 fruits have sometimes been exhibited, have stimulated efforts to improve their growth and cultivation.

The Agricultural Returns for 1889 show the orchards in Devonshire as extending to 26,555 acres, or an increase of about 550 acres in the decade. In Cornwall in the same period the acreage returned rose from 4,842 to 5,092 acres. The bulk of the produce is made into cider, though of late years the growth and sale of table apples for dessert and culinary purposes has received attention. The average annual value of the produce is estimated roughly at 10% per acre, but this is considerably exceeded on farms where due attention and skill are devoted to the subject. Instances are known of returns of three or four times that amount from individual orchards in favourable seasons. Every farm has its orchard or orchards on a more or less extensive scale. The largest percentages are, however, to be found in the districts around Totnes, Exeter, Crediton, and Moreton Hampstead, and in the valleys of the Clist and Creedy. Here the climate and soil are most favourable to the growth of apples, and it is not uncommon to find from 30 to 40 acres of orchards upon a farm, although they are mostly in small detached portions of 2 or 3 acres, or even less, apiece, planted on sheltered slopes and hollows. One farm at Langridge has about 100 acres of orchards in a large number of small enclosures.

The apple crop, like all other fruit crops, is an uncertain and precarious one; but on an average of seasons it can be made very remunerative where proper and intelligent management is

devoted to its growth and subsequent treatment, as was found to be the case on some of the competing farms. But throughout the two counties generally, there are numerous evidences of neglect of orchards in the past which will require some years of care and attention to repair. The cost of this repair, and the question of whether it should fall upon the landlord or upon the tenant, may not infrequently be a reason for the present delay in undertaking it. A new tenant is naturally averse to making good his predecessor's neglect, or to providing trees from which no profit can accrue for some years, unless he either has a lease of sufficient duration to recoup him, or is secure of compensation when his tenancy expires.

The difficulty is not insurmountable, whilst the beneficial results which are almost certain to follow ought to encourage both parties to join in its removal. Landlords will find it to their interest to provide the trees, and the tenants will reap full benefit from their after attention to them. Failing this, the Agricultural Holdings Act offers a practical solution.

CIDER.

The manufacture of cider has long been associated with the farming of Devonshire, where the first British orchard is said to have been planted. In 1630 cider-making is mentioned by Westcote in his *View of the County*, and in 1763 the then Chancellor of the Exchequer imposed an excise duty of 4s. per hogshead upon the beverage; but the inhabitants of the county, instead of disputing over the disposal of the duty after it was raised, attacked the root of the matter, and agitated so strongly against the duty itself that the Legislature was fain shortly afterwards to remove it.

The cider produced annually in Devonshire is estimated to amount on an average to about 250,000 hogsheads, whilst that in Cornwall is put at 20,000 hogsheads. In the latter county the bulk produced is consumed at home, or sold to local inn-keepers, but from Devonshire between 50,000 or 60,000 hogsheads are exported annually by cider manufacturers, of whom there are several in the county. The value of this exportation is put at from 100,000*l.* to 130,000*l.*, whilst the value of the whole produce may be taken at from 250,000*l.* to 300,000*l.*

Without entering upon the details of cider-making, it may be sufficient to mention that the processes of development adopted by the farmers of Devon take one of three forms, viz. (1) the simple grinding of the apples and placing of the juice after pressing in hogsheads, and leaving it there without any

special after-treatment or attention; (2) the careful manipulation of the cider, and regulation (checking or promoting) of its fermentation by a process of racking, fining, and matching after it has been placed in the casks; and (3) the sale of the apples or of the pulp ("pomace") at the "pound's mouth" to the cider manufacturer, who deals with it subsequently on his own premises.

The first of these methods produces the hard or rough cider, which is preferred by the local consumer, and forms part of the remuneration given to the farm labourer, who, despite the modern "Truck Act," is unwilling to part with his daily allowance of cider. The other two processes result in that delicious beverage which is so much appreciated in London, Oxford, and other parts of the country.

LIVE STOCK.

Devon is ahead of all other counties in the kingdom in the number and rank of its native breeds of stock. It claims two native breeds of cattle (North Devon and South Hammers), four of sheep (Devon Longwool, South Hams, Dartmoor, and Exmoor), and two of ponies (Dartmoor and Exmoor). Cornwall, on the other hand, can boast of no native breeds, but indulges mainly in crossing those of other districts.

The "North Devon" breed of cattle is too well known to require description. Who that has witnessed the parade of these neatly shaped animals at the Royal Shows can have failed to admire their symmetry, their compactness of form, evenness of flesh, lightness of offal, and other attributes which constitute them so essentially the butcher's beast of the period? All that the severest critics of animal form can find to urge against them is that they are "small"; but that is a merit which butchers nowadays profess to appreciate, especially when offered larger animals.

These North Devons are almost the only variety found in the northern part of the county. Their hardiness and ability to thrive and fatten on high ground constitute them the most profitable animals for that district. A great stimulus has lately been given to this breed by the high figures obtained at Lord Falmouth's recent sale, where the highest price ever bid at a sale for a Devon was given by Mr. W. H. Punchard, of Totnes, who, with Mr. Williams of Caerhays, bought numerous animals for introduction into South Devon.

In the southern part of the county the South Ham, or South Hammer, is the animal mainly kept. This, the native

breed of the locality, is totally distinct from the North Devon, or its larger neighbour the Somerset Devon, though it is believed to have descended from the "Rubies." Its form and characteristics are, however, entirely different, and even its colour is several shades lighter than that of its supposed northern progenitors. The contrast between the two breeds was, perhaps, never more apparent than during the parade of the prize animals in the Plymouth Show Ring. Certainly the full-grown South Hams bull followed the young heifer calves of the northern race; but, for all that, he filled the eye at once, and looked a veritable giant compared with the compact and neat little sires that had preceded him. Authorities differ very much as to what is the correct type or colour of the South Hammer, and the absence of a herd-book militates against its breeders or admirers arriving at definite conclusions thereon. The animals are a large-framed and useful race, with excellent milking qualities, and an aptitude, when arrived at maturity, for putting on flesh rapidly. But as young stock they are not attractive, developing too often the "razor-back" and light-yellow colour of the Guernsey, with which the breed has apparently at times been crossed.

A critical eye can at once detect that the occasional rough and sloping quarters, the upturned and round horn, the long plain head with prominent eyelet, and the light-yellow hairs are due to such a cross, though many years may have elapsed since it was made. Mr. Tanner, in 1845, called the breed a distinct one, but condemned "the careless mode of breeding then adopted as removing all hope of improvement." He then goes on to mention that it was a frequent practice to keep one Guernsey cow to every 10 or 12 Devons, to improve both the quality and appearance of the milk produced. Probably these Guernsey cows would be served by a South Ham bull, and the progeny be retained for further breeding. Then the succeeding generations would get so mixed up with the local breed that it could hardly be distinguished or severed from it. The establishment of a herd-book would prevent future repetitions of this, though it might be at the expense of gradually losing the milking qualities which the cross has undoubtedly added. For milk the present race cannot be surpassed—24 quarts daily is no unusual quantity for a South Hammer to give. The breed has been much improved during the last fifteen years, mainly by a more careful and judicious selection of the sires used; but there is room for more general attention to this matter. Breeders of the South Hams scout the idea, however, of reverting to the "North Devon," and *vice versa*; though, if the good

properties of both could be combined, a most perfect dairy-farmer's animal would be the result. The line is, however, at present strictly drawn between them, and certainly North Devons do not thrive in South Devon, nor the South Hams in the district of the others.

Attempts have been made to introduce the Shorthorn, Jersey, and Polled Angus, but none of these breeds have been freely patronised or supported by Devonshire farmers. Cornishmen have, however, taken slightly to the Shorthorn, and some good results can be traced to Messrs. Hosken's and other pedigree herds. The majority of the animals in Cornwall are cross-bred and chiefly Guernsey and Shorthorn. Mr. C. W. Williams, of Caerhays, is substituting North Devon for Polled Angus.

On the four breeds of Devon sheep (Devon Longwool, South Hams, Dartmoor, and Exmoor) praise cannot be too highly bestowed. Each has its special good qualities, and in its own district makes the best returns to its breeder. All show an aptitude to fatten (sometimes it is to be feared at the expense of the supply of milk to their lambs), and all carry heavy fleeces of wool of long staple, though getting somewhat coarse according to the climate and altitude of the land they have run upon. No mountain breed anywhere can show better wool, or get to heavier weights, or arrive earlier at maturity than the Dartmoor and Exmoor flocks. At the Paris International Exhibition last year a pen of Devon Longwools took first prize and gold medal over all other long-woolled breeds, including Lincolns and Leicesters, &c.

Breeding flocks are kept upon most farms, but the increase of any of the breeds rarely reaches 125 lambs to the 100 ewes. The best of the ewe lambs are retained for the flock. The remainder and the wethers are reared and fed off at from 9 to 12 months of age, or sometimes after the second shearing. This latter would be when the sheep are 15 to 16 months of age, as the lambs are always shorn at the first shearing time after birth. For some reason which has not yet been explained the percentage of sheep to the 100 acres of cultivated land has fallen off considerably during the last twenty years. In 1869 the percentages were for Devon 94·85, and for Cornwall 84·82, whilst in 1889 they are 69·74 and 69·30 respectively. The percentages of other stock remain about the same.

IMPLEMENTS.

It is said that 80 years ago waggons were unknown in Devonshire, chiefly on account of the narrowness of the roads

preventing their use, and some modern commentators go so far as to say that many of the existing ones are either the original importations, or true copies of them. Anyway, very little can be said in favour of those now in use, except that they are light, and are passable in a Devonshire lane, which would certainly not be the case with the heavier and broader ones more commonly used elsewhere. The smallness of their wheels and narrowness of their tyres must add much to their friction, and certainly must badly cut up the public and other roads. Carts are also of comparatively modern introduction. The genial father of one of the farm competitors can recollect unloading manure from wooden boxes or crates in which it had been carried up on a pack-horse's back.

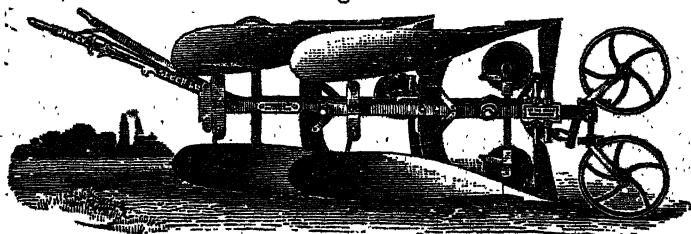
Fig. 1.

But the most useful implement now general throughout the two counties, and which might with advantage be more used elsewhere, is the Balance and Turnwrest Two-Furrow Plough, of which figs. 1 and 2 are examples.

These ploughs were introduced some fifteen years ago by Messrs. Davey, Sleep, & Co., and immediately came into general favour. Three horses were seen working abreast in them, driven by one man, and appeared to accomplish their work with ease and rapidity. A $6\frac{1}{2}$ -acre field was pointed out as having been ploughed over 7 to 8 inches deep with one of these ploughs by three horses and a man in



Fig. 2.



three days, and such a rate of work was mentioned as frequent in the county. Being turnwrests, their furrow slices are all turned one way, and no furrows are left. On hilly and siding ground the ploughs, as indeed do most other implements in

the district, follow the contour of the land so as to work with greater ease, and in all cases when approaching the ends of the furrow lines the ploughs are turned upwards or outwards so that no headlands are left. For heavy land the "Climax" is preferred. On some farms excellent work was seen done by a Chamberlain Digging Plough. Most of the other implements worked by horses are of the ordinary patterns in general use, but the hand-tools are somewhat ancient and clumsy.

DEVONSHIRE CREAM.

The method which is known as the scald-cream process is the one almost invariably in use in the dairies of the two counties. Very rare indeed are the instances in which the ordinary or raw-cream system is adopted. Each day's milk is scalded on the following morning, except in sultry weather, when the morning's milk is scalded the same evening. The scalding is done by placing the tins of milk, as they come from the dairy, into water in either a copper "scald" or bath (which holds two tins at a time, and which is afterwards placed on a stove), or in a specially prepared stove, in the top of which are holes to admit of four tins being scalded at the same time. The heating of the water and the scalding are so regulated as to gradually increase the heat of the milk, but never to cause it to boil. In "thunder" weather the scalding is done more rapidly, otherwise the milk turns sour during the process. The scalding occupies some 15 to 20 minutes, and is considered complete when small bubbles or blisters begin to appear under the head of the cream. The tins are then taken back to the dairy, where they remain till next day, when the cream, which by this time has become firm, is lifted bodily off, and placed in glasses, or small cans, in which it can be sent by Parcel Post, or otherwise, to the actual consumer. If not sold as clouted cream, it is made into butter, which is produced readily enough by stirring for a few minutes in a dish with either the hand or a wooden spoon.

It is not within the province of the writer to discuss the relative merits of this and the raw-cream process. Before making such a comparison, it would be necessary to ascertain more correctly the actual time and labour required for each process, and the proportions of cream and butter obtained from the same quantity of milk, together with sundry other items. He has simply to chronicle that he found the scalding process almost absolute in the two counties, and that it will probably remain so as long as the demand for Devonshire cream exists.

He is bound further to mention that in all his travels through the two counties he never met with bad butter, for all the butter which appeared on the hotel and other tables was invariably sweet and good. To test the keeping qualities of one dairy, a sample was taken home and kept for a month, at the end of which time it was every bit as good as at first, and had not changed its flavour. Severe critics might say that it never had much of a flavour to change, and in this respect it certainly was inferior to the best of raw-cream butter. But the latter varies greatly, and in some respects is not so reliable as butter made from the scalding process. Besides, absence of strong flavour is often more noticeable than the presence of much sweetness in the foreign butter that appears on the tables of the great London and other hotels.

FIELDS AND FENCES.

Devonshire is well known as the land of small enclosures. In an interesting essay on this subject in Vol. V. of the First Series of this Journal, Mr. Grant, of Exeter, estimates that within an area of 37,000 acres dealt with, there existed 1,651 miles of fences, occupying 2,642 acres, or $7\frac{1}{2}$ per cent. of the whole. The average size of the fields he found to be 4A. 2R. 22P., and out of 7,997 enclosures 7,670 were less than 10 acres apiece. This estimate is applicable to many districts at the present day, if indeed it is not in excess of actual facts. Need of shelter is urged as the chief reason for the retention of these numberless division fences, though, curiously enough, the greatest proportion of small enclosures is to be found in the valleys and on the best land where trees and plantations abound. On many of the higher districts, where trees are scarce and shelter more needed, the fields are larger. Fully one half of the existing fences might in places be removed without unduly exposing the land or depriving it of shelter, and much land could thereby be added to the cultivated area. Many instances were noticeable of adjoining fields, of 2 to 3 acres apiece, on the same farm, being under the same crop, where the division fences could be spared without the slightest interference with the cropping, or to the prejudice of the grazing of the seeds.

The fences, or more correctly speaking the banks—for they are mainly of earth with a short growth of scrub on the top—are generally not less than 2 yards wide at bottom, 6 to 8 feet high, and so nearly perpendicular that they are not easily negotiable by sportsmen who have weight and age to carry. Being thus composed of a soft and loose material—covered only with grass, or weeds, or ferns, and such like—the banks are easily

Fig. 3.

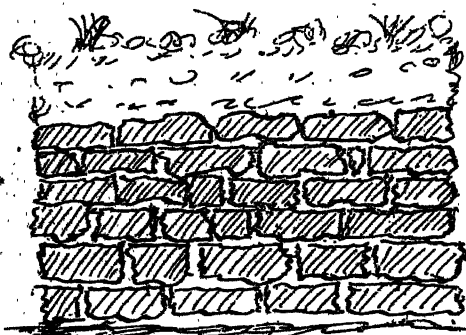


Fig. 4.



Fig. 5.



crumbled down by cattle running their horns into them, or putting their forefeet on when cropping the herbage of the upper part. To guard against this, a common practice is to place a row of barbed wire on posts, which are driven either horizontally into the banks, or vertically at their feet, so as to hold the wire up to about half the height of the bank, and from 1 to 3 feet from its face. But the most permanent improvement (next to actual removal of the bulk of them) is to face the bank with stones, where they are obtainable at reasonable cost. Much of this work has been done of late years, and offers an effectual barrier to the crumbling referred to. Sometimes the stones are laid flat with their narrow ends or faces to the front, as in fig. 3. Where the stones are long and thin they are placed vertically (because they then offer less foothold for the cattle) as in fig. 4. A third method, where

the stones are broad—in other words, where they are flags—they are placed broadside on, as in fig. 5. A variation by

way of neat appearances is made by placing the alternate rows of stones with zigzag inclinations—"Jack and Joan" as it is locally called, or "chop and block" when these rows are irregular (see figs. 6 and 7). This stone facing is usually built up to about 4 feet in the height of the fence. The work when let costs from 2s. 6d. to 3s. per yard ($16\frac{1}{2}$ feet run of 4 feet high) for labour on each face, the stones costing 1s. per cart at the quarry. In many instances the landlord pays for the stones, and the tenant carts and pays for putting them in. One instance was met with of an entirely new fence which had recently been erected with stone facing ("Jack and Joan") on each side filled up with

Fig. 6.

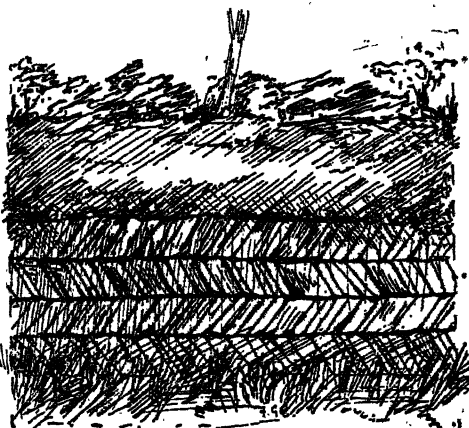
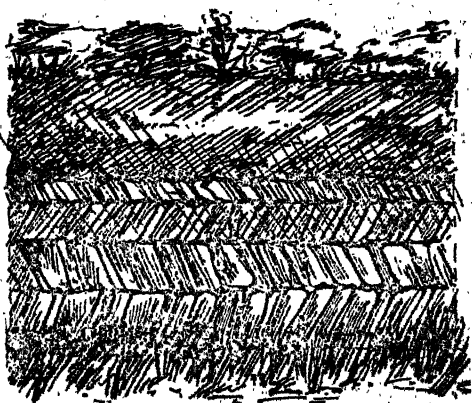


Fig. 7.



earth, and in all $5\frac{1}{2}$ feet wide at bottom, $2\frac{1}{2}$ feet wide at top, and $5\frac{1}{2}$ feet high, and which had cost 10l. for about 130 yards of 3 feet run. Probably the same stones built in an open wall would have made an equally good fence for less money, and with only one yard instead of two being taken up at the foot.

At most gateways the ends of fences or banks are built up with rubble masonry, set in mortar, and when well done with good "beddy" stones are neat and permanent erections.

THE PRISON FARM, PRINCE TOWN.

A record of the farming of Devonshire would be incomplete without some reference to this Farm, where the unwilling labour of our convicts, condemned to penal servitude, is turned to good account in the reclamation of land. But space will not allow of more than a mere summary of the management which here has converted a large tract of poor waste land into some of the most productive enclosures in the kingdom.

The farm, which lies in the wilds of Dartmoor, at an elevation of some 1,400 to 1,600 feet above the sea level, is held by the Government authorities from the Duchy of Cornwall under an improving lease. It comprises in all 2,000 acres, the whole of which was mere common or unenclosed waste land prior to 1850, when the Dartmoor Prison, originally erected for the confinement of prisoners captured in the French and American wars, was converted into a convict settlement. Then commenced the work of reclamation, which has now extended to 1,300 acres, and is being continued at the rate of 25 acres yearly. The land is divided into square fields of from 15 to 20 acres by high stone walls built of granite boulders raised in the prison quarries, or from the land as the work of reclamation proceeds. Broad and excellent roads have been made, intersecting the farm where needed, and are being extended as required. The land is first trenched 2 to 2½ feet deep, the lower layer being merely turned over, and not brought to the surface, whilst the surface sod is buried about a foot in depth. Where necessary stone drains are put in at 3 feet or deeper, according to the position of the clay in which they have to be placed, and at intervals of from 30 to 40 feet.

The first crop is usually rape or rye (according to the time of year at which the land was ready). This is fed off by sheep, and a crop of swedes taken, which again is fed off by sheep, getting also cake and corn. Seeds are then sown for a short term (2 or 3 years), and afterwards broken up preparatory to the land being cropped under a short rotation, and ultimately laid down to permanent pasture. Swedes are the first crop in this rotation, and are followed by barley, with which are sown the seeds for permanent grass. The mixture for the latter which is found to answer best is as follows:—Perennial rye-grass, 8 lb.; Italian rye-grass, 4 lb.; cocksfoot, cow-grass, white clover, and trefoil, 3 lb. each; meadow-grass, timothy, and meadow foxtail, 2 lb. each; various fescues and alsike clover, 1 lb. each; in all, from 34 to 36 lb. per acre. If the herbage fails, or becomes unsatisfactory, the land

is again dug up and put through a similar rotation ; but so good has been the management, and so careful and judicious the selection of seeds in the past, that the greater portion of the pastures laid down within the last 15 to 20 years are now in far too good a condition to require re-breaking. One field which 20 years ago was mostly rushes is now able to carry a bullock per acre through summer. No cleaner or purer pastures are to be found anywhere than those laid down on this farm within the last few years.

Sixty-seven acres of meadow land have been laid out for irrigation and utilisation of the sewage from the prison establishment, which at times numbers upwards of 1,000 persons. The sewage is precipitated in two settling tanks by the aid of sulphate of alumina placed in the main sewer about 200 yards above the tanks in a large box with a perforated bottom, over which a water tap is fitted so as to regulate the quantity consumed at different times of the day. Milk of lime is also used at the entrance to the tanks. The effluent water is used for irrigation, the solids from the tanks being applied to the land above the level of the carriers. Hay and silage are both made from the crops off this land.

Thirty acres are devoted to the growth of garden vegetables, and are divided into square plots of an acre each by high hedges of elder, which grows and thrives well here, and provides much shelter from spring frosts. All kinds of vegetables are grown, and much success has been obtained in the growth of celery and cucumbers, of which latter as many as 700 have been raised and sold in a season : 120,000 plants of cabbages and winter greens are raised and planted out yearly.

A dairy herd of 45 cows is kept, and all the calves are reared. Any additional "bullocks" (which term in the two counties means cattle of both sexes and all ages) required are purchased, and then fed off. The animals selected are, on account of the altitude, mainly North Devons ; but as dairy properties are here of almost as much importance as hardihood, it is not surprising to find in many of the cattle a dash of other blood, and an occasional cross of some more prolific milking breed. The dairy is managed on the ordinary, or raw-cream process.

A flock of 400 sheep, "Improved Dartmoors," is kept, and has frequently been successful in the local show-yards. The wool, for so high a district, is remarkably good, and of long staple, and at the present time is expected to realise 7½d. to 8d. per lb. One ram seen had just clipped 27 lb., and the hogs averaged 14 to 15 lb. per fleece.

Thirty-five pony mares and their produce run on some of the

fields, and in addition about 50 mares (Dartmoor and Exmoor ponies) are taken in for a summer's run, and stinted to selected sires. One of the latter now in use is a grandson of the celebrated "Sir George," whilst another won first prize in its class at the Royal Show at Plymouth. Seventeen cart mares, chiefly Clydesdales, are kept for the carting, and are mostly bred from. The nine foals bred this year are by a Clydesdale stallion bought at Ayr Show. Much of the produce is sold to and consumed in the prison establishment: the rest is sold off either to residents in the districts or to Plymouth. Annual auctions of surplus live stock are held, at which 1,400*l.* or 1,500*l.* worth are often sold. Private sales of ponies, sheep, and pigs are also made.

The whole of the work is done by the convicts without the aid of horses, except for carting. The men work in gangs of ten, with a warder for each gang. Sometimes ten or a dozen gangs will be at work in one field, digging, hoeing, carrying manure in handbarrows, &c., under the supervision of the warders, and with guards with loaded rifles posted round to prevent escape.

The management of the farm is under the able direction of Mr. Alex. Watt, F.S.I., and is a notable example of what skill and capital can accomplish in the improvement of land.

CONCLUSION.

Upon the whole, Devonshire and Cornish farmers are to be congratulated upon their present position, and upon many advances in their local agriculture which have been made since the two previous reports referred to were published. There may not in the two counties be as much of that "fine" or "high" farming and large expenditure of capital which are to be found in the Eastern, Midland, and Northern counties; but, on the other hand, the investment of capital there has been a safer one, and has been accompanied by less loss throughout the recent agricultural depression. Farming for profit and a living, and not for mere occupation, show, or amusement, is the chief characteristic of the South-western agriculturist, who appears to have combated more successfully the recent depression than many of his fellow-farmers elsewhere have been able to do. His life may be one of hard work, his management may be less high, and his style of living less ambitious than that of his wealthier brethren, but he has throughout recent years had less occasion to regret that want of profit which has been experienced in many of the best-farmed parts of the kingdom—and, after all, the pursuit of agriculture is robbed of much of its pleasure when the annual balance-sheets show a succession of deficits.

F. PUNCHARD.

THE PLYMOUTH MEETING, 1890.

FIVE-AND-TWENTY years have elapsed since the Royal Agricultural Society paid its first visit to the Three Towns. With the field of the Society's active operations bounded only by the coast line of England and Wales and the border-line of the Cheviots, Plymouth, with the associated towns of Devonport and Stonehouse, represents, up to the present, the westerly limit of its annual migrations. Only twice previously, indeed, has the Society, during the half-century of its existence, penetrated into the great county of Devon—great as a maritime county, the fame of whose seaports is inscribed upon the archives of England; great as an agricultural county, with breeds of cattle and sheep and pigs peculiarly her own; and great absolutely, inasmuch as the extent of her broad acres is exceeded by that of only two other English shires—York and Lincoln. The two former Devonshire Meetings were in 1850 at Exeter, and in 1865 at Plymouth. In 1875 the Society travelled as far west as Taunton, eighteen years previous to that the meeting was at Salisbury, and on two occasions—1842 and 1878—Bristol has been the rendezvous.

THE SHOW-GROUND.

The site of the Show-ground was peculiarly beautiful. As in 1865, it occupied the rich hilly grazing lands of Penny-comequick, from the summit of which—in the centre of the Showyard—one of the most picturesque views that even picturesque England can afford could be enjoyed. The rapid incline, which faced the visitor after he had passed the entrance-gates, compelled the Surveyor to somewhat shorten the main central avenue which he is accustomed to take as a base-line, as it were, from which to develop the minor features of his plan. But, arrived at the highest part of the ground, at the verdant open space where, during four days of the Show, the band of the Royal Marines discoursed sweet music, the eyes of the visitor were gladdened with a panorama which is probably unsurpassable.

Beneath the sunny sky glanced the blue waters of Plymouth Sound. Ships at rest and ships in motion only served to bring into greater prominence the faint low line of the famous breakwater stretched across the mouth of the vast harbour, whilst far away in the dim distance could be discerned, loom-

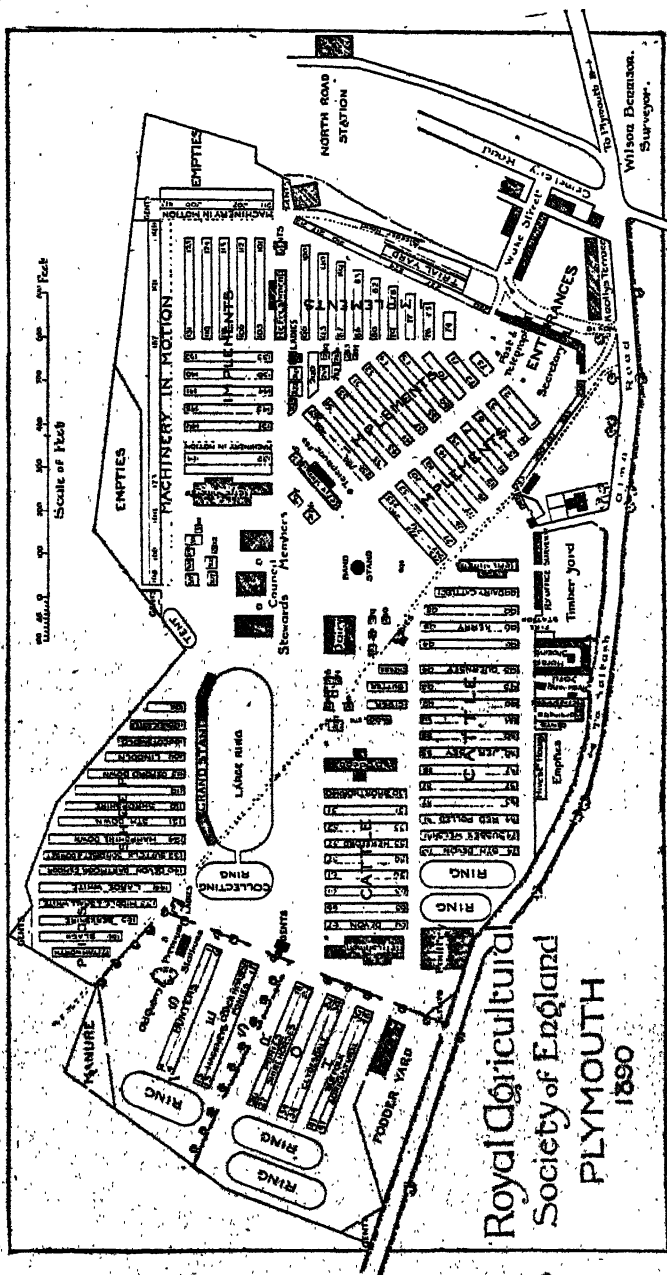
ing against the sky, the wonderful structure from which, night after night, are poured forth the warning beams of the Eddystone Light. The beautifully wooded slopes of Mount Edgcumbe, rising abruptly from the water's edge, bounded the vista on the right, and farther away to the west rose the Cornish Heights; to the north stretched the undulating green fields which become lost in the granite wilds of Dartmoor; eastward were the fertile pastures of the South Hams; whilst close at foot, bordering the Sound, could be seen the famous Hoe whereon Drake, three hundred years ago, was playing his historic game of bowls when the news of the approach of the Spanish Armada reached the English shore.

With its lines thus cast in pleasant places, the fifty-first Annual Exhibition of the Royal Agricultural Society of England opened under auspicious circumstances. It was the privilege of but few of the visitors to have personal recollection of the former Show of 1865, though there were at least five active participators in the first Plymouth Meeting who were also present at the second. These were Sir Massey Lopes, Bart., then; as now, Chairman of the Local Committee; Mr. John Dent Dent, who, in 1865, officiated as Senior Steward of Live Stock; Earl Cathcart, who acted at the former Meeting as one of the Stewards of Implements; Sir Jacob Wilson, who, first elected on the Council in 1865, undertook office also as one of the Judges of Implements that year; and Mr. Charles Norrington, who as Mayor in 1865, and as Local Treasurer in 1890, rendered the Society on both occasions most valuable and willing service.

PRIZES AND ENTRIES.

It is the invariable practice of the Society at its Country Meetings to institute special classes for local breeds of live stock. Whilst, therefore, what may be regarded as the main staples of the English breeds are annually brought into competition, opportunities are afforded in one locality and another of stimulating progress in the development of breeds which have become more or less exclusively identified with certain districts. Amongst the sections which were thus brought into prominence at Plymouth may be mentioned the Dartmoor and Exmoor ponies, the South Hams cattle and sheep, the Dartmoor and Exmoor sheep and Devon Long-wools, to which may be added black pigs.

It is possible to institute an instructive comparison between the two Plymouth Meetings by detailing side by side the



various sections of live stock for which prizes were offered in 1865 and in 1890. This is done in the following statement, Horses being given first, though, in the Stock Catalogue of 1865, Cattle occupied the place of honour:—

HORSES.			SHEEP.	
PLYMOUTH, 1890	PLYMOUTH, 1865		PLYMOUTH, 1890	PLYMOUTH, 1865
—	Thoroughbred Stud horses		Leicester	Leicester
Hunters	Hunters		Cotswold	Cotswold
Coach horses	—		Lincoln	Lincoln and other long-wooled
Hackneys	Hackney brood mares		Oxford Down	Oxfordshire Down
Ponies	Ponies		Shropshire	Shropshire
Dartmoor ponies	Dartmoor ponies		Southdown	Southdown
Exmoor ponies	Exmoor ponies		Hampshire Down	Hampshire and other short-wool led
Shire	—		Suffolk	—
Clydesdale	—		Somerset and Dorset horned	Somerset and Dorset horned
Suffolk	Suffolk		Devon Long-wool	—
Agricultural (not qualified to compete as Suffolks, Clydesdales, or Shires; adapted to a hilly country).	Agricultural (not Suffolks)	(not Suffolks)	South Devon	South Hams
			Dartmoor	Dartmoor
			Exmoor	Exmoor
CATTLE.			PIG.	
Shorthorn	Shorthorn		Large White	Large White
Hereford	Hereford		Middle White	—
Devon	Devon		Small White	Small White
South Devon (Hams)	South Hams		Berkshire	Berkshire
Sussex	Sussex		Any other Black breed	—
Welsh	—		Tamworth	—
Red Polled	—		—	Small Black
Jersey	Channel Islands		—	Any other breed
Guernsey	—			
Kerry	—			
Dexter Kerry	—			
Dairy cattle	—			
—	Other established breeds			

During the interval between the two visits to Plymouth, Shires and Clydesdales have obtained for themselves a distinctive place in the catalogue—they have been permanently differentiated from the heterogeneous assemblage of "Agricultural Horses." Coach horses were classed this year, but not in 1865. As to Thoroughbred Stud Horses, although there was no competition at Plymouth, the successful competitors at the Spring Show were, as is subsequently mentioned, on view.

As regards cattle, the Welsh and the Red Polled, and more recently the Kerry and the Dexter Kerry, have obtained separate recognition; whilst the Jersey and Guernsey are no longer shown collectively under the common designation of Channel Islands Cattle. With reference to this point, it is worth recalling that, in his report as Senior Steward of Live Stock at the former Plymouth Meeting, Mr. Dent advocated the offering of separate prizes for Jersey and for Guernsey cattle, "instead of placing them both in the same class." There was no class for Dairy cattle in 1865, and all cattle not qualified to compete as either Shorthorn, Hereford, Devon, South Hams, Sussex, or Channel Islands, were relegated to the mob of "Other established

breeds." It is interesting to note that the substantial awards in this class went, in 1865, five to Suffolk Polled, two to Longhorn, and one to Norfolk Polled, whilst the only barren honour recorded went actually to a Kerry—a red cow. The Norfolk and Suffolk men have, as is well known, long since settled their differences, and, under the designation of Red Polled, they possess a breed whose future is one of progress.

The schedules of sheep show less variation. In 1865, however, the Devon Long-wools were forced into alliance with the Lincolns; and the Suffolks, if there were any, were penned with the Hampshire Downs. As to swine, the Middle White and the Tamworth breeds have now separate classification. The prize pigs in the "Any other breed" class of 1865 were variously described as "Middle," "Carhead Middle," and "Yorkshire Middle."

A statistical comparison of the live-stock entries at the two Plymouth Meetings is afforded in the following table, from which it will be seen that this year's total entries were more than double those of 1865, the greatest proportional increase being in the horse classes. The value of the prizes offered on the two occasions is also shown:—

	ENTRIES			PRIZES		
	1890	1865	Increase in 1890	1890	1865	Increase in 1890
Horses	333	92	241	£ 1,503	£ 770	£ 733
Cattle	642	410	232	1,754	1,200	554
Sheep	571	236	335	1,315	920	395
Pigs	223	119	104	452	225	227
Total	1,769	857	912	5,024	3,115	1,909

To complete the comparison of the two Shows, it should be added that there were no poultry at the earlier Meeting, and that wool and butter were the only kinds of produce competing for prizes. There were no classes for cheese, for cider and perry, for jams and preserved fruits, or for hives and honey. Nor had competitions in butter-making or in horse-shoeing at that time received any recognition.

In the Implement Section prizes were this year offered for light portable motors, grist mills, disintegrators, plant for cider making, and dairy appliances. In 1865 a large number of prizes were awarded for drills, manure distributors, horse hoes, mowing machines, hay-making machines, reaping machines, horse rakes, waggon, and carts. On both occasions silver

medals were offered for "miscellaneous" implements entered as "new." On the present occasion these were awarded for an improvement in an instantaneous butter maker, a butter worker, a disintegrator, and a horse rake. In 1865 they went to a broadcast seed machine, a tubular churn, semicircular pomeltrees, a combined flax-breaking and scutching machine, a combined sawing, planing, moulding, tenoning, grooving, and boring machine, a cattle trough, and a rotary harrow or twitch extirpator.

The following statement of entries for the 1890 Meeting, compared with those of the seven previous years, will be useful for purposes of record:—

Number of animals in stockyard	Plymouth, 1890	Windsor, 1889	Nottingham, 1888	Newcastle, 1887	Norwich, 1886	Preston, 1885	Shrewsbury, 1884	York, 1883
Horses . .	333	996	546	500	493	438	407	611
Cattle . .	642	1,644	644	626	681	539	579	462
Sheep . .	571	1,109	537	513	446	433	490	412
Pigs . .	223	265	148	194	203	203	211	200
Total .	1,769	4,014	1,875	1,833	1,823	1,613	1,687	1,685
Poultry .	695	861	343	405	191	325	—	—

Shedding in Implement Yard (in feet) [Exclusive of open ground space]	Plymouth, 1890	Windsor, 1889	Nottingham, 1888	Newcastle, 1887	Norwich, 1886	Preston, 1885	Shrewsbury, 1884	York, 1883
Ordinary . .	feet 6,117	feet 10,378	feet 7,253	feet 5,508	feet 7,155	feet 8,417	feet 9,315	feet 9,569
Machinery in motion . .	1,291	2,496	1,607	1,125	2,017	2,063	2,085	1,949
Special shedding (including seeds, models, &c.) . .	1,670	2,728	1,883	1,584	1,640	1,520	1,554	1,618
Total . .	9,078	15,602	10,743	8,217	10,812	12,000	12,904	13,136

THE SHOW.

The Implement Department was open to the public on Saturday, June 21, and the whole yard from Monday, June 23, to Friday, June 27. "The Implement Day," as the Saturday is termed, was marked by sunny skies and pleasant breezes which augured well for the success of the meeting, at least so far as the weather—no mean consideration—was concerned. The whole week indeed was characterised by exceedingly

favourable outdoor conditions. A heavy fall of rain took place, it is true, on the Thursday morning, but it was acceptable rather than otherwise on the ground of the much-trodden Show-yard, whilst the afternoon and the following day were again delightfully pleasant.

All day on Saturday the live stock were arriving and taking up their allotted positions. Long, however, before the hour appointed for divine service on the Sunday, the whole ground presented a neat, trim appearance, and everything was in readiness for the busy day to follow. The Rev. W. St. Aubyn, Rector of Stoke Damerel, conducted the service, which was held in the large tent on the ground, and the Bishop of Exeter, Dr. Bickersteth, delivered an impressive sermon from the text (Jeremiah xvii. 7, 8), "Blessed is the man that trusteth in the Lord, and whose hope the Lord is. For he shall be as a tree planted by the waters."

Early on the Monday morning Sir Jacob Wilson, as Honorary Director, received the Judges in the large tent, and, having thanked them for placing their knowledge and experience at the service of the Society, succinctly explained their various duties, which they at once proceeded to discharge. It was late in the evening when the final stock awards were posted up. On the following morning the general meeting of members (a report of which is given in the Appendix, page cxvii.) was held in the large tent, Lord Moreton occupying the chair.

This was decidedly the most brilliant day of the Plymouth Meeting; for once the almanack was right, and it was Midsummer Day, not only in name, but in nature—one of those gloriously beautiful days which we appreciate and enjoy the more in this country because of their rarity. The scene in the middle of the ground at about the time of the afternoon parade will not soon be forgotten by those who witnessed it. The excitement of yesterday's contests had died away, the battle of the breeds languished, the sun shone out of a sky unflecked with cloud, the heat was moderated by a delicious breeze from off the gently rippled sea, and gathered upon the rich green-sward of Pennycomequick were the youth and beauty of Devonshire.

During the remaining three days admittance was obtainable at the popular price of one shilling, but the largest attendance was on the Wednesday, when 39,308 persons paid for admission at the turnstiles. For a long series of years Wednesday has been a half-crown day, and the price of admission has not been reduced to a shilling until the fourth day of the Meeting. This year, in deference to the strong representations of the Mayor of

Plymouth that Wednesday was a customary half-holiday in the Three Towns, when many workpeople and others who would otherwise be unable to visit the Show would be at liberty, it was resolved by the Council that a third shilling day should be tried this year as an experiment. The results were not such as to warrant a continuance of the plan, for the two shilling days on Wednesday and Thursday caused the attendance on the final day to drop to fourteen thousand, which is the lowest figure of the last ten years.

Taken as a whole, however, the attendance, considering the comparatively scanty population of the district and the absence of any large centres of industrial activity, cannot be considered unsatisfactory. The subjoined Table shows the number of persons who paid for admission on each day during the last eight Shows, including Plymouth, and also, for comparison, the figures at the last Plymouth Show a quarter of a century ago:—

Day of Show	York, 1883	Shrews- bury, 1884	Pres- ton, 1885	Nor- wich, 1886	New- castle, 1887	Notting- ham, 1888	Wind- sor, 1889	Ply- mouth, 1890	Ply- mouth, 1865
Implement day	300	194	394	148	1,209	1,326	493	194	25
First day	3,012	2,133	3,557	635	1,097	1,671	6,223	1,334	1,063
Second day	15,768	11,211	21,713	8,074	11,331	11,103	18,808	10,008	4,787
Third day	21,920	13,474	19,318	10,894	12,020	9,057	24,890	39,308	17,260
Fourth day	63,097	49,374	34,302	42,774	77,410	88,333	32,965	32,371	42,943
Fifth day	24,120	17,690	14,908	42,394	24,305	35,438	44,493	14,026	21,963
Total	128,117	94,125	94,192	104,909	127,372	147,927	155,707 ¹	97,141	88,036

¹ Including 28,034 on sixth day (Saturday).

Much disappointment was expressed when it became understood that the numerous engagements of the Prince of Wales would prevent His Royal Highness from attending the Show. In 1865 both the Prince and the Princess graced the Meeting with their presence, and the recollection of that auspicious occasion is still vivid in the minds of the loyal West-country folk. But though the Prince was not present in person, various entries in the live-stock sections had come from distant Sandringham. The support accorded to the Show by the two Royal past Presidents of the Society was, indeed, of a most gratifying character. Her Majesty the Queen was represented by no less than 12 entries, all from Windsor. These comprised a Clydesdale filly and three Hereford bulls and two heifers from the Flemish Farm, and four Shorthorn bulls and two heifers from the Prince Consort's Shaw Farm. The Prince of Wales entered three Shorthorn bulls and seven pens of Southdown sheep from Sandringham.

The genuinely hearty welcome accorded to the Society and its members by the good people of the Three Towns will always be

one of the pleasantest memories of the recent Meeting. West-country hospitality is proverbial, and it was exercised to the full during the latter days of June. The ancient seaport town made a gala week of the occasion, and neither expense nor trouble was spared to do honour to Agriculture—the most ancient of arts, the most universal of industries.

The Mayor of Plymouth (Alderman H. J. Waring) was indefatigable in his efforts to promote the success of the Meeting, and in honour of the Society entertained about 300 gentlemen at luncheon, on the Wednesday, at the Guildhall—a beautiful building, of which any city in the world might be proud. In giving the toast of “The Queen” on this occasion, the Mayor referred to Her Majesty as a past President of the Royal Agricultural Society, and in proposing that of “The Prince and Princess of Wales” he spoke of His Royal Highness not only as a past President of the Society, but as the Duke of Cornwall, and as the Lord High Steward of Plymouth. The Earl of Mount Edgcumbe, in responding for the “Reserve Forces,” said he was commissioned by the Prince of Wales to express, in the most public way he could, His Royal Highness’s regret at being unable to attend the Plymouth Meeting. The Prince, his Lordship added, was specially interested in the present gathering, for it could not fail to prove instructive and beneficial to His Royal Highness’s agricultural tenants in the immediate neighbourhood. The Earl of Ravensworth, President-elect, responded to the toast of “The Royal Agricultural Society of England,” and expressed his sense of the kindness the Society had met with.

There have, indeed, been but few Meetings which the “Royal” has held during the fifty years of its history that can compare for heartiness and for smooth working with that at Plymouth. All the Society’s requirements were complied with in the most cordial and ready manner, and the Local Committee deserve the warmest acknowledgments for the manner in which, thanks chiefly to their Honorary Secretary (Mr. Richard B. Johns), all their arrangements were carried out.

In the following notice of the various Classes at Plymouth the views of the Judges are embodied, the quotations being taken from the Judges’ reports.

LIGHT HORSES.

Thoroughbred Stallions.—The three thoroughbred stallions in the Plymouth catalogue, *Eclipse*, *Jack Tar*, and *Lancastrian*, were the winners of the three premiums of 200*l.* each and special gold medals offered by the Society at the Spring

Horse Show held in London last March. They all looked well after their season of service in the South of England, and there were but few of the visitors interested in horses who did not take the opportunity of inspecting the trio.

Hunters.—The hunters were, on the whole, not remarkable either in numbers or in quality, and there was a decided lack of uniformity amongst the exhibits. The local entries were hardly as strong as might have been expected. About one-half of the substantial honours went to northern counties, whilst of the five premier awards three went to Yorkshire and the remaining two to Cornwall.

In Class 1, for hunter mare and foal, half a dozen entries came forward, at the head of which the Judges had no difficulty in placing Captain Danby's *Melrose*, a brown mare, eleven years old, showing much hunting character, and with good legs and action. Mr. Boles's second prize mare, *Huntress*, displayed good hunting action; whilst the third prize mare, *Lavinia*, was rather deficient in quality, with not the best of shoulders.

Class 2, hunter fillies (three years old), were not regarded by the Judges as a particularly good lot. The character of the class was somewhat redeemed by the presence of Mr. Mitchelson's Lancashire-bred first prize filly, and of Col. MacGregor's Somerset-bred second prize winner *Medici*, the former possessing beautifully clean limbs with fine action, and the latter being a mare of much quality and a good mover. Of the six hunter fillies (two years old) in Class 3, *The Nun* was easily placed first. She was low in condition and capable of much improvement, for she possesses high breeding, and showed nice level action.

Of hunters up to 12 stone (Class 4a), some very useful specimens were exhibited. The first prize horse, *Danube*, is an animal of great merit. "He has very fine quality, is a grand galloper, and has good manners." The second prize went to *Nimrod*, a useful stamp of hunter; and though Mr. A. H. Blyth's third prize animal "promises to develop into a workman, he cannot be considered a show horse." Hunters up to 15 stone (Class 4b) call for no special remark, the premier award going to an average weight-carrying hunter.

The four-year-old hunters (Class 5) formed a class which was generally above the average in quality. Mr. Wilkinson's *Summertime* "is of good breeding and has splendid legs, his bone being of the best quality. He moves well all round." The second prize went to *Cinnamon*, an excellent stamp of horse, and though the third prize winner, *Avalanche*, has capital legs, he hardly moved so well in his slow paces as the first two. The reserved horse in this class galloped as well as any animal in the

ring, and the one placed next to him, and highly commended, moved in good form.

Coach Horses.—These made quite a Yorkshire show, for, with the exception of two entries from Suffolk, they all came from the Ridings. The largest class was that for all-aged stallions; the mare and foal class, on the other hand, was vacant. In so remote a county as Devonshire, the stallion class must be regarded as a decidedly creditable one. The Judges considered the first prize horse (Mr. Stericker's *Master George*) "a beautiful specimen of a young coaching stallion." A Yorkshire coach horse himself, his sire was from a Cleveland bay mare of good quality. Of three-year-old fillies, three came forward, and of two-year-old fillies two. The latter made rather the better class.

Hackneys.—The seven classes in this section were not proportionately any better filled than the four classes of coach horses, whilst the animals were of very varied character. In the class for stallions above fifteen hands, the well-known sire, *Doctor Syntax*, met with no competition, and if there had been any disputants his neat limbs and admirable action would have rendered him hard to beat. At the head of the class for stallions between fourteen and fifteen hands was placed a horse whose figure is familiar in the ring at Islington. The Judges describe *Evolution* as "an all-round good animal, likely to make a very valuable sire." Next to him was placed *Glendale*, "a very useful horse, with good feet and legs, a beautiful colour, and a good mover." The third prize horse, *Gem*, appeared to be rather light of bone, and, though a fair mover in front, his hind leg action might be better. The two-year-old stallion class was headed by *Doncaster*, a good mover, but light of muscle along his back. The second prize horse, *Macumazahn*, is a strong utility horse, that looks like getting carriage horses. The class for mare and foal above fifteen hands contained the best type of hackney in the Show, and, as a brood mare, *Sweetbriar* will be very difficult to beat. The second prize fell to a mare (*Martinet*) of nice quality, but better suited for a hunting brood mare than to compete with the hackneys. The class for mare and foal between fourteen and fifteen hands contained but one entry, *Lady Alice*, sent by the owner of *Evolution* and *Doncaster*; nevertheless, she would have commanded the premier position in a good class. Hackneys from fourteen to fifteen hands made but an indifferent group, whilst in the class for hackneys above fifteen hands the only animal of any merit as a hackney was the winner of the first prize, the one placed second being more of a driving horse.

Ponies.—Of the pony classes, that for stallions not exceeding fourteen hands was most conspicuous in point of merit. Interest centred in it from the fact that Mr. Francis's *Lord Nimrod* and Mr. C. W. Wilson's *Little Wonder 2nd* again met each other, the victory going, as it did at the Spring Horse Show, to the former. *Lord Nimrod* is three years younger than his competitor, but both are reported by the Judges as possessing very exceptional merit. In the small class of brood mares Mr. Wilson's *Snorer* added another victory to her highly creditable record. The class for ponies above 12 hands 2 inches and not exceeding 14 hands was saved from utter mediocrity by the presence of Mr. Pope's *Maggie*, against whom all the younger entries in the class could make no stand, and to whom was assigned the championship of certain of the pony classes. With the further exception of Major-General Talbot's second prize mare, *Ranee*, the class was of a very indifferent character. A better lot of animals made their appearance in the 12 hands 2 inches class, which was worthily headed by *Bantam*, a neat and shapely little gelding, placed in reserve to *Maggie* for the championship.

Dartmoor and Exmoor Ponies.—Numerous visitors to the Show made a special tour of inspection of these sections, as it was felt that the opportunity should be an unusually favourable one for obtaining some reliable ideas as to the special characteristics of the equine produce of the Devonshire moors. Great, therefore, was the disappointment at the meagre display, there being only 17 Dartmoor ponies and as few as five Exmoor in the catalogue. The Judges say "the Dartmoor and Exmoor classes were a failure." Of the Dartmoor ponies the stallion class was the best, though it was remarkable rather for variety than for numbers. In the Exmoor section two of the classes contained but one entry each, to which first prizes were awarded. The stallion *Katerfelto* is, however, not pure bred, being the grandson of a thoroughbred horse. The three Exmoors shown under saddle were all noticed by the Judges, the red rosette falling easily enough to *Queen Bee*.

HEAVY HORSES.

Shires.—Though in the distant Western County less than 50 animals came before the Judges in the Shire horse classes, there were nevertheless to be seen at Plymouth many specimens of sufficient merit to have taken a high position at any display of the breed in England. It is to be noted that the Judges departed from the previous rule of the Society, in the circumstance that no prizes to horses or mares above a year old were

awarded until the animals had been before the Veterinary Inspector, and received a certificate as to freedom from hereditary disease. It is satisfactory to learn that not many were found unsound, and the fact that some few were will probably serve to explain the position of certain entries which might otherwise have taken good places.

The class of three-year-old stallions was a good one for the neighbourhood, though only three or four out of the ten could in any sense be claimed as local. The first prize went to a familiar figure to Shire breeders—Mr. W. Arkwright's *Marmion II.*—which the Judges describe as "a grand animal, with beautiful silky hair, splendid feet, and a magnificent all-round mover, with great growth and character, but might be better on his hind legs." To him subsequently fell the champion prize as the best Shire stallion. Next in order in the class awards were Mr. P. A. Muntz's *Cameronian* and Mr. Walter Gilbey's *Warrior Duke*, "both very useful animals, with a good deal of substance and character, though the latter would have looked better if he had not lost his hair."

In the two-year-old stallion class the nine entries were all present, and made a good display. Lord Hindlip's *Hindlip Champion* went to the top of the class, and was reserved for the championship, being "a very attractive animal, with an abundance of nice hair, plenty of character, and moving well." The second prize horse, *Echo's Victor*, is a small colt of beautiful quality and good hair, but his action behind is capable of improvement.

In an exceedingly useful class of yearling stallions, the first place was assigned to Mr. John Rowell's *Bury Victor Chief*, "a really beautiful colt, of grand character and good size, with plenty of bone and quality." *Scarsdale Rocket*, a very promising animal shown by Mr. Arkwright, was second; and the third prize went to *Knowle Loyola*, "a fine mover, with lots of bone and good middle, but lacking quality."

The mare and foal class was blank owing to two absentees. For fillies foaled in 1887 there were two entries, both excellent. *Western Primrose*, "a grand mover and full of quality, with flat bone and good hair, but rather leggy," was placed first, and was reserved also for the champion colours, which found a resting place in the next class. *Shilton* was recommended for second prize, being a nice compact mare, but rather short of growth.

Of fillies foaled in 1888 eight faced the Judges, by whom they were regarded as "a very good lot." *Challenge*, "of good size, with beautiful feminine character, good feet, and nice quality hair, but goes a little close in front," was placed first,

and was selected for the champion prize as the best Shire mare or filly. *Moulton Fantastic*, which came next, is very good in character, but rather small. The third prize went to *Oalwick Gaudy*, "a nice thick-set mare, but not much freedom of action." A beautiful mare placed in reserve would have been higher up, but "had gone all to pieces."

The yearling fillies were, as compared with the other classes, rather deficient in merit. *Scarsdale Sparkle*, the first prize filly, "is big, rather awkward, and a little short of quality, but a good mover." *Hindlip Lady* was placed second, "a plain, poor filly, nice quality, good mover, and looks like making a big mare." *Rokeby Rhoda*, who came third, "was rather poor, but of very nice quality."

It is worthy of note that the two best animals in the stallion classes—*Marmion II.* and *Hindlip Champion*—were by *Harold* 3703. Similarly, the two best animals in the female classes—*Challenge* and *Western Primrose*—were by *Bar None* 2388.

Clydesdales.—Of Clydesdales there was a creditable entry, considering the remote locality, and that no entry came from nearer than Somerset. England was responsible for 20 entries, Scotland for 11, and Wales for four. Regarding the Clydesdale classes as a whole, the Judges report them to be, "alike in respect of numbers and merit, as good a display of the breed as was ever made at a Show of the Royal Agricultural Society of England, and fully compensates the Society for their liberality in offering such handsome prizes. The leading prize-takers possess the distinguishing characteristics of the breed, viz., strong, flat, flinty bone, excellent feet and pasterns, and free stylish action."

The three-year-old stallions made a good typical class, two of them being of exceptional quality. The first prize horse, and champion of the stallion classes, *Macara*, "is very gay and stylish-looking, his action being excellent, and his forelegs and feet very good; he was in perfect showyard bloom." The second prize horse, *Prince of Kyle*, "has less substance than the first and is not so good a mover, but is full of quality; he was shown in bad bloom." *The Crusader*, placed third, seemed rather out of condition, and was not moving well.

The two-year-old stallions were really good as a class. The premier award went to Mr. Andrew Montgomery, the owner of *Macara*, for *Prince Darnley*, "a very promising colt, showing true Clydesdale characteristics." The second prize went to *Lustra*, "a stylish Clydesdale with beautiful hair; a grand mover, but rather leggy." *The MacCash*, the third prize winner, possesses good breeding qualities.

In the small class of mare and foal the first prize fell easily to *Nettie*, "a splendid mare with extraordinary action and full of quality." The second prize mare, *Edith*, possesses great substance and has the characteristics of a good breeding mare.

The five three-year-old fillies made an excellent class. The first prize filly, *Scottish Rose*, "is remarkably well made up for her age; her action is grand, and her forelegs and feet are unusually good." The second prize, *Bell*, "is a beautifully brought out filly, but deficient in her forefeet and pasterns." *Gladys*, "a big filly, but wanting in action," was third.

The best and largest class of Clydesdales in the showyard was that of the two-year-old fillies, at the head of which the Judges placed *Scottish Snowdrop*, and afterwards awarded her the champion prize as the best Clydesdale mare or filly. They describe her as a beautifully symmetrical animal, her movement being remarkably good, and her hock action specially excellent. The Earl of Cawdor's *Decreto*, though of less substance than Mr. Scott's filly, "is full of quality and a very true Clydesdale." The third prize went to *Silver Bell*, a big filly, but lacking the quality of the first two.

Suffolks.—Every credit is due to the Suffolk breeders for the grand display of horses they made at Plymouth. As many as 56 animals were in the catalogue, and of these 47 put in an appearance, most of them having travelled some 350 miles to get to the Showyard. Excepting the very meritorious half-dozen sent by Mr. Hume Webster from Surrey, and a solitary entry from Berkshire, all the Suffolk horses came direct from the county whence they derive their name. The Judges regarded the whole exhibit as fully maintaining the high reputation of the Suffolks.

In a good class of three-year-old stallions the first prize went to Mr. W. H. Hewitt's *The Ozar*—"a massive grand horse, with lots of bone and good feet."

The two-year-old stallions were a very strong class, both as regards numbers and quality, 14 putting in an appearance out of 17 entries. The first prize colt, *Winston*, is well grown and has capital legs and feet. Mr. Hume Webster's *Nottingham* was second—a big stylish colt of nice quality and a very good type of the breed. Many other excellent animals were to be seen in this, the best of the Suffolk classes, and the Judges commended the entire class.

Stallions foaled in 1889 made a satisfactory class, at the head of which was placed a very big well-grown chestnut colt, sent by the Duke of Hamilton and Brandon. He was, however, closely pressed by Mr. Hewitt's *Windsor Chieftain*,

which, though possessing not quite so much bone, is full of quality. *Wedgewood II.* is a very stylish colt with good feet and legs, and there were in the class several other colts of considerable merit.

The mares and foals were better in quality than in number. *Queen of Diamonds*, "a massive, well spread, valuable mare of good type," was placed first. Mr. Hume Webster's *Metile* (second) and his *Eva* (reserve number), as well as Mr. Wolton's *Pearl* (third), were also good specimens of the breed.

Amongst the three-year-old fillies were several of great merit, especially the first prize filly, *Queen of Hearts*. *Grecian Bend* and the Duke of Hamilton's *Sprightly* are also grand animals.

The fillies foaled in 1888 were headed by a big, well-grown, smart-looking filly, *Violet*. The second prize went to another handsome filly, *Belle*. The yearling fillies were a very useful class, both the first and second prize animals possessing considerable merit.

It is interesting to read in Mr. Dent's report on the exhibition of live stock at the former Plymouth Meeting in 1865, that on that occasion there were some good Suffolk horses in an entry numerically poor, and it was then suggested that the Suffolks should be allowed to compete with other horses, except in their own particular districts.

Agricultural Horses.—Entries in this section were described as "Agricultural Horses, not qualified to compete as Suffolks, Clydesdales, or Shires; adapted for a hilly country." It was not, however, productive of any remarkable entry of local agricultural horses, a circumstance which the Judges regret, there evidently being great room for improvement in this direction in Devonshire.

There were only two entries of stallions foaled previously to 1888. The first prize went to Messrs. Yeo Brothers for *Sweet William*, "an active clean-legged stallion suitable to the district," of good size and a neat mover.

The class for mares or geldings brought forward a few useful animals for Devonshire farms, though it cannot be said that any of the seven entries showed any special character. Mr. John Wills's first prize gelding, *Wallace*, is a wide powerful grey horse.

CATTLE.

Shorthorns.—Out of 67 entries of Shorthorns, 61 put in an appearance. The Judges observe that this is by far the smallest number of this popular breed that has been exhibited for many years, but this circumstance becomes less surprising when it

is remembered that the Show took place at one end of the kingdom. Nevertheless, the exhibitors whose names were in the catalogue represented sixteen counties in England, and one county each in Scotland, Ireland, and Wales, so that the "red, white, and roan" sufficiently maintained its ubiquitous character at Plymouth. Cornwall was at the head of the county list with 10 entries, Devonshire being responsible for only three. Despite the small number of entries—small, that is, for the Shorthorn breed at the Royal Show—the quality of the animals was of a most superior character, several of the classes putting forth entries of marvellous excellence. At the former Plymouth Meeting 92 Shorthorns were entered.

In the aged bull class, 6 animals came before the Judges, who found in it nothing of very great merit excepting Mr. Deane Willis's handsome bull *Challenge Cup*, which was reserved for the male championship of the breed.

Of the two-year-old bulls 9 out of 11 appeared, and 5 were noticed by the Judges. All the prize animals in this class were of good Shorthorn character, the first prize bull, *New Year's Gift*, exhibited by Her Majesty the Queen, receiving the champion prize as the best male Shorthorn. This honour was won only with difficulty, for *New Year's Gift* met with a formidable opponent in Mr. Willis's *Challenge Cup*, and a third opinion had to be sought in making the award. These rivals for the champion colours are both Scotch-bred Shorthorns.

In the yearling bull class the 17 animals shown included several of considerable merit. The first prize bull, Mr. Willis's *Count Lavender*, should be heard of again. The Judges "noticed a defect in his propagating qualities, and requested the opinion of the Veterinary Inspector, who considered that his stock-getting powers were not affected."

In the cow class five animals appeared, but it is seldom that animals of such superior excellence are seen in the show-ring, every one of them being considered by the Judges as quite worthy of a first prize. Mr. Robert Thompson's *Molly Millicent* was placed at the head of this admirable class, the same breeder's *Inglewood Gem* being third, Mr. C. W. Brierley's *Marchioness of Waterloo* 6th coming between them. *Molly Millicent* possesses the true characteristics of a Shorthorn, and has been a winner at previous Royal Shows. On this occasion she easily won the champion cup as the best female Shorthorn.

Of two-year-old heifers 11 came forward, 5 of which gave the Judges considerable difficulty, so much so that it was not until the assistance of the Umpire had been called in that, in one or two cases, the order of precedence was decided. Lord

Polwarth's red and white heifer *Truth* was first, and was placed next to *Molly Millicent* for the female championship. The second prize fell to the representative of another north-country herd, the Duke of Northumberland's *Fairy Rosebud*.

Yearling heifers were a class of very superior merit, the Judges noticing 9 out of the 13 that came before them. The prize-winners were all of considerable promise, especially the first prize heifer *Rosalind*, from Her Majesty's herd at Windsor.

Herefords.—The "white faces" were practically identical in number with the Shorthorns, and, like the latter, made up a most meritorious display. In the aged bull class the laurels went to the Earl of Coventry's *Rare Sovereign*, his old and sometimes victorious opponent, Mr. John Price's *Radnor Boy*, being placed second. The whole class was of good quality, all the four entries being noticed.

In the two-year-old bull class the prize-winners were of exceptional merit, *Grove Wilton 4th* being placed first.

The class of yearling bulls was both large and good, and here again the prize-winners were of special excellence.

The cows, though but few in number, were regarded by the Judges as superior to any corresponding class previously seen at a Royal Show. The first and second prizes went to the Croome Court herd, for *Rosewater* and *Ladywood* respectively, the first-named retaining all the quality which had before made her famous.

In a good class of two-year-old heifers Mr. Thomas Fenn secured first and third places with *Downton Fancy* and *Windsor Belle*, the intermediate award going to Mr. Richard Edwards for *Sheriff's Sunlight*.

Yearling heifers were a numerous class with several promising heifers, the first prize heifer, *Promise*, being perchance prophetically named.

Devons.—These are essentially the West-country breed, and a fine display of the "Rubies" seemed a foregone conclusion. The Judges report, however, that the classes (61 to 66) of North Devon cattle "were as a whole well filled, though some of the animals had better have remained at home."

In the senior bull class Mr. J. C. Williams's first prize bull *Marmaduke* is a good symmetrical animal of true type. The second prize fell to *Fancy's Robin 2nd*, "a very heavy good beast, but drops a little too much from his groin to the tail." A useful bull, *The Vicar*, was placed third, and the remaining four entries in the class all secured notice.

In the two-year-old bull class the first prize went to

Viscount Portman's *Royal Windsor*, "a nice symmetrical bull, and a good type of the North Devon breed," originally bought, it appears, by Lord Portman's agent for fifty shillings. *Duke of Bourton*, a very level animal, was placed second, whilst *Champion 2nd*, a good growing and fleshy bull, was third.

The yearling bulls are reported by the Judges as exceptionally good. Mr. John Tremayne's first prize bull, *Lovely Laddie*, was perfect save in the horns. *Fancy's Gordon* appeared to be a big bull for his age; whilst the third prize bull, *The Count*, is of decidedly useful character.

The cow class had distinction conferred upon it by the presence of Sir William Williams's *Flower 2nd*, the Devon champion at Windsor, who maintains her beautiful symmetry and fleshy qualities.

A good class of two-year-old heifers gave the Judges some difficulty on account of a marked want of uniformity in size. *Rosebud*, a fine growing heifer from the Pound Farm herd, was placed first, being closely followed by Mr. W. H. Punchard's *Lady Jane*.

Yearling heifers were throughout a satisfactory class, and, indeed, an exceedingly pretty one. The first place was secured by Sir W. Williams with *Fiction 2nd*.

South Devons (Hams).—These were one of the sights of the Show, and crowds of visitors, impelled by curiosity, turned their steps to the stalls occupied by the "South Devons," "South Hams," or "Hammers," in order to take full advantage of so favourable an opportunity for acquiring some knowledge of this strictly local breed. How local is their distribution is shown by a glance at the catalogue, from which it is seen that the 34 entries were all made from the districts around Plymouth, Plympton, Ivybridge, Kingsbridge, and Totnes. If on the map a line be drawn from Plymouth eastward to Totnes, a triangular area is marked out, of which this line is the base, and the southern coast-lines culminating at Start Point form the two sides. This area is the native home of the South Devon cattle, of which it is strictly correct to say that they left an agreeable impression upon the minds of those who saw them at Plymouth. Whether or not they have an ancestral relationship with the North Devons, they present little external resemblance to the "Rubies" of to-day, for their colour is far more suggestive of the yellowish coats of the Guernseys. They possess good milking properties, but they are larger, coarser, less compact, and altogether less well-bred than the dainty cattle whose native pastures cover the hill slopes of North Devon. The Judges regarded the South

Devons as "an exceptionally good lot, the competition for honours being very keen."

They further say :—

"Although the area upon which this particular breed of cattle is reared is comparatively small, there are large numbers which find a ready sale for grazing purposes in the neighbourhood. They are also good for dairy purposes. From time to time other breeds have been introduced into the South Hams, but they have been found not to answer like their own breed."

Sussex.—Of the 30 animals in the catalogue, 23 put in an appearance, a number that cannot be regarded as unsatisfactory, considering that the breadth of England stretches between the Devonian Peninsula and the Weald of Kent and Sussex. The Judges report the section as of high average merit.

In the senior class a grand massive bull, *Lord Beckley 6th*, went to the top. The second prize was awarded to *Goldfinder*, a good-shaped bull, under three years old. *Jubilee*, the Sussex male champion at Windsor, had to lower his colours, and only secured third place—"a very heavy bull, showing want of symmetry, either from being overfed or from the long journey."

In the two-year-old bull class, *Lord Oweye* had an easy victory. He was "a good first, and will be hard to beat at any time, competing with animals of his own age."

The cows were found a difficult class to judge on account of great range of age. *Virgin 20th*, a handsome three-year-old cow, was placed first, the second prize going to another good cow in *Peace 6th*. Heifers—two-year-olds and yearlings together—made the best of the Sussex classes. *Pearl*, a smart yearling, was first, and *Damsel*, a very even two-year-old heifer, was second. The third prize heifer was somewhat overfed.

Welsh.—It is matter for regret that the Principality was not better represented. Entries came from two herds only. The two female classes were entirely vacant, and of the 135*l.* offered as prize money, 75*l.* was not competed for. The two animals in the old bull class possessed an exceedingly high degree of merit, and were excellent specimens of the breed. Of young bulls also there were only two, both good. In each class Lord Harlech was first, and Mr. H. R. Sandbach was second.

Red Polled.—In view of the distance that separates Devonshire from East Anglia, the Red Polls were a most creditable display, for, with the exception of a couple of entries from Herts, and one from Kent, they were all from Norfolk or Suffolk. West-country breeders did not fail to avail themselves of the means thus offered of studying the merits of a breed whose fame is in the ascendant.

In the old bull class the first prize went to a grand speci-

men of the breed in Mr. Harvey Mason's *Erebus*. In the young bull class an exceptionally good animal, Mr. Colman's *Laureate*, was first. In the cow class, *Doris* is a beautiful specimen. The second and third prizes went to Mr. Tyssen Amherst, M.P., the latter for *Emblem*, who "has been very handsome." Last year she took the championship at Windsor as the best female Red Polled.

Heifers were the largest class, and so good that every animal secured notice. As in the Sussex classes, so here, the yearlings and two-year-olds were classed together, thereby occasioning the Judges considerable difficulty. *Prize*, a specially good two-year-old, was placed first, and *Emerald*, another good two-year-old, was second.

Jerseys.—As is so often the case, this pet breed carried the palm as regards numbers. In making their awards the Judges endeavoured to select those animals which, in their opinion, combined high breeding, symmetry, and great milking properties. At the top of the old bull class was placed Mrs. Custance's *Thornford Gem*, "a bull of great richness, and handles extraordinarily well, though his horns leave something to be desired." The bulls placed first and second, and especially the former, "looked far more likely to get dairy stock and good milk producers than others in the class, as they were so much more feminine in appearance and much finer in quality."

In the two-year-old bull class *Sir Joseph* won easily, being "far in front of the other competitors, and of rare proportions, great length, symmetry, and richness of colour." The second prize-winner, *Gaveroch*, is a very taking animal; whilst *Augereux Nelson*, which is third, "though still retaining the richness of colour which was so remarkable at last year's Dairy Show, has scarcely the quality he then showed."

Yearling bulls were a large entry, and it was only after long and careful consideration that the Judges assigned the first place to Mr. Cash's *Grouville's Mannikin*. "This bull is a little slack behind the shoulder, but he handles beautifully, and he is of a quality, richness, and symmetry seldom combined at his age." The second prize bull, *Columbus*, was also of fine quality, but rather narrow behind. The large number of commendations awarded in this class testifies to its high quality.

The cows formed a class of singular excellence, and here again the minor honours were very numerous. The first prize went to the island-bred cow *Wigton*—"she is very fine in every particular, and has evidently great milking properties." *Victoria*, scarcely inferior in quality to *Wigton*, was second, and

Sweet Secret was third, both being island-bred animals, and both well known in the show-ring.

At the top of a large class of two-year-old heifers was placed Mr. Cornish's *Little Mecca*. This light grey heifer the Judges regard as of great merit, as she shows high breeding and has indisputable milking qualities. All three prize-winners in this class are island-bred. About a dozen others were noticed.

Yearling heifers made another large class, with many animals of almost equal merit. The first prize went to Mr. Crookes's *Pomona's Charm*, bred in Hampshire, and the third to the same exhibitor's *Rosy Dawn*, Lord Rothschild's *Miss Rosy* being second. Seven others were selected for empty honours.

Guernseys.—The Judges report these classes as of exceptional merit, and they suggest that in future two-year-old heifers and yearling heifers should receive separate classes. Of old bulls only four came forward, and there was no difficulty in placing at their head the Windsor champion, Mr. W. H. Carrington's *Rydale*. "He shows all the good points and quality of last year—straight, level, with a splendid loin and rump, and a deep full barrel, he is a magnificent specimen of the breed." The second prize went to Mr. Ozanne's *Souvenir*, a three-year-old bull of good quality, rich in colouring and good in skin, though lacking the massiveness of *Rydale*. Sir F. A. Montefiore's third prize bull, *Black Prince*, is "a level good animal, fairly rich in quality." The reserve is a straight bull, but very "throaty." These four bulls are all island-bred.

Of young bulls, 15 were in their places, and the class was of such excellent merit that the Judges noticed 10 of them, though they experienced much difficulty on account of the various ages. The first prize went to Colonel Shakerley's *Paradox*, "an extremely good animal, almost as large as the old bulls in the previous class; he is island-bred, of rich quality, good horns, and straight back, with the tail fairly well set on." The second and third prizes went to bulls bred in England. *Frolic 2nd* is a very good bull, with nice head and neck, but high and a little coarse on the rump. *Papageno* is nearly a year younger than the first prize bull, and is of most promising appearance.

At the head of the cow class it was easy to place that most charming creature, *Pretty Dairymaid 2nd*, who won the female championship in the Guernsey classes at Windsor. "A more beautiful specimen of a Guernsey cow cannot be found—marvellous in her vessel, with splendid milk-vein and rare escutcheon, beautifully fine in the china, and a wonderful milker." Milked in the presence of the Judges in the ring she gave thirteen quarts.

The second prize went to a well-known English-bred cow, *Nora 3rd*; she has a perfect head and neck, but stands a little high on her hind legs. *Fairy 2nd*, a cow of true Guernsey type, ran close for second place, but age told against her. Many other cows in this class were of special merit.

Heifers went into the ring to the number of 27. They made a splendid class, many of them well deserving more than the honorary notice they received. The first and second prizes went to heifers that had calved, third and reserve to heifers that had not. *Pretty Dairymaid 4th* was placed first. An island heifer, and daughter of the first prize cow, "she is of excellent quality, very straight, tail well set on, good skin, with excellent vessel and milk veins." A superb heifer, *Damsel 2nd*, took the second prize. The third prize went to *Norah 6th*, "perhaps the best animal in the whole class, but, being only eleven months old, she had no chance against the winner, which was two years old." She is a lovely heifer of rare quality. The whole of the yearling heifers are reported by the Judges as far above the average in quality.

Kerry and Dexter Kerry.—The several classes of Kerry and Dexter Kerry cattle were well filled by some excellent specimens from various parts of Ireland and England. In the Kerry classes, 30 entries were by Irish exhibitors and 14 by English; in the Dexter classes, 28 entries were by Irish exhibitors and 23 by English. The 37 English entries won two-thirds of the prizes. Cows in both sections were particularly well represented. Owing to the desire of the Judges to attach special value to milking qualities, they were mainly guided by these characteristics in making their awards.

In the Kerry bull class, the handsome bull *Aicme Shuel* was first. Of two dozen Kerry cows the Judges noticed more than half, and placed at the top the beautiful cow *Peep*.

In the Dexter bull class *Fascination*, the shapely little bull which attracted so much attention at last year's Dairy Show, was first. All the prizes in the Dexter classes went to English exhibitors.

The Plymouth Show was taken advantage of by Kerry breeders in order to make the merits of the Irish blackskins better known in the West. Many of the local visitors must have looked upon these pretty little cattle for the first time. With the exception of one Somerset breeder, the English exhibitors hailed from the distant counties of Wilts, Hants, Surrey, Middlesex, Suffolk, Northampton, and Oxford.

The subjoined observations of the Judges are of interest:—

"There seems to be some misapprehension as to particular points of the Kerry and the Dexter Kerry. There is no reason why this should be so, for the Kerry and the Dexter Kerry are totally different in points and shapes. The former is well known by its light, deer-like head and horn, light limbs, with ribs, hips, and shoulders well set, thin skin, straight back, light, well-set tail with long brush, and its predominant colour, black. The Dexter Kerry, on the other hand, takes very much of the character of a diminutive Shorthorn; short, strong legs, square body, flat back, thick shoulder, short neck, and well-set head and horn. A cross between these two breeds must produce an animal which is neither a Kerry nor a Dexter Kerry. We are convinced from the great progress made in so short a time in bringing these useful breeds into such prominence, that by careful selection and breeding from the best specimens, the Kerry especially will in a very short period become a very valuable and profitable breed of cattle in our islands. Both breeds are highly calculated to add eventually a valuable item to the dairy industry of the country. These are the only purely Irish breeds of stock, and Irishmen should feel gratified to see that English noblemen and gentlemen are studying the development of a long neglected Kerry race of cattle."

DAIRY CATTLE MILKING TRIALS.

The entries in this class, notwithstanding the fact that nine prizes were offered for competition, were but ten in number, and of these seven only actually competed. The prizes were awarded under the following conditions, the class being divided into three sub-sections, according to the live-weights of the COWS:—

CLASS 101.

Cow, in milk, of any Breed or Cross, giving the greatest quantity of Milk, containing not less than 12 per cent. Solids, and 3 per cent. Butter-fat.

PRIZES OFFERED.

Division A. (Cow over 1,200 lb. live-weight).—First Prize, 15*l.*; Second Prize, 10*l.*; Third Prize, 5*l.*

Division B. (Cow between 900 and 1,200 lb. live-weight).—First Prize, 15*l.*; Second Prize, 10*l.*; Third Prize, 5*l.*

Division C. (Cow under 900 lb. live-weight).—First Prize, 15*l.*; Second Prize, 10*l.*; Third Prize, 5*l.*

The cows were milked dry on Monday morning, June 23, under the supervision of the Steward of Cattle, Viscount Emlyn, and immediately afterwards weighed. At five o'clock on Monday evening the cows were again milked, the weight of milk recorded, and samples taken for analysis. The second milking took place at seven o'clock on Tuesday morning, the milk of each cow being again weighed, and samples taken for analysis.

The Table on page 561 shows the weights of milk yielded by the different animals at the two milkings, and the composition of the milk, as ascertained by the Consulting Chemist.

CLASS 101.—COWS IN MILK, OF ANY BREED OR CROSS, GIVING THE GREATEST QUANTITY OF MILK CONTAINING NOT LESS THAN 12 PER CENT. SOLIDS AND 3 PER CENT. BUTTER-FAT.

No. in Class	Name of Exhibitor	Breed of Cow	Live-weight	Weight of Milk		Total Yield of Milk	Specific Gravity of Milk		Percentage of Solids		Percentage of Butter-fat		Prize
				Monday evening	Tuesday morning		Monday evening	Tuesday morning	Monday evening	Tuesday morning	Monday evening	Tuesday morning	
964	DIVISION A (Cows over 1,200 lb. live-weight) Thomas Cundy . .	Crossbred	lb. 1250	lb. oz.	lb. oz.	lb. oz. 54 10	1-030	1-0342	%	11-80	%	2-50	1st.
				24 0	30 10								
				14 8	22 8								
				16 6	25 0								
965	Thomas Cundy . .	South Devon	1472	14 8	22 8	37 0	1-0316	1-0308	14-44	13-24	5-25	4-90	2nd.
969	George Sampson .	Shorthorn	1297	16 6	25 0	41 6	1 0295	1 0317	12 22	11-16	3-80	2-50	below standard
963	DIVISION B (Cows between 900 lb. and 1,200 lb. live-weight) Joseph Britton . .	Jersey	1012	12 12	17 8	30 4	1-0307	1-0327	15 21	13 63	5-99	4-30	2nd.
				25 4	32 10	57 14							
				14 10	22 6	37 0							
				14 10	18 2	32 12							
967	A. J. Fortescue . .	Dutch	1130	—	—	—	—	—	—	—	—	—	—
968	Sir F. A. Montefiore, Bart., ...	Guernsey	1043	14 10	22 6	37 0	1-0315	1-032	13 40	12-07	4-40	3-10	1st.
962	DIVISION C (Cows under 900 lb. live-weight) George Blackwell. .	Jersey	883	14 10	18 2	32 12	1 0278	1-0308	17-23	15-50	8-29	6-23	1st.
				—	—	—							
				—	—	—							
				—	—	—							

E. W. VOELCKER, Acting Consulting Chemist.

Mr. Voelcker reports that in Division A, for cows over 1,200 lb. in weight, the cross-bred cow, *Beauty*, yielded the large quantity of 54 lb. 10 oz. of milk, and although the quality of the milk of Tuesday morning was slightly below standard, that of the Monday evening was of high quality, and, taking the two milkings together, the average composition of the milk was well above the limits laid down. The shorthorn cow, *Daisy* (No. 969), was ill. According to the statement of the cowman, she had been completely upset by the long railway journey, and had quite gone off her feed.

In Division B, the Dutch cow (No. 967) yielded the very large quantity of 57 lb. 14 oz. of milk in the two milkings, but the milk was poor and below the standard.

In Division C, for cows under 900 lb. live-weight, there was only one entry, and it is to be regretted that none of the Kerry cows were entered for the competition. The Jersey cow (No. 962), the only cow in Division C, yielded milk of extraordinary richness, and a very fair quantity. The Monday evening milk contained over 17 per cent. of total solids, of which more than $8\frac{1}{2}$ per cent. was butter-fat; the Tuesday morning milk contained $15\frac{1}{2}$ per cent. of total solids, of which $6\frac{1}{2}$ per cent. was fat. These figures were so high that it was thought desirable to check them by analysing the duplicate samples which were taken on each occasion: the results of the second analysis exactly confirmed those first obtained.

SHEEP.

Leicesters.—Forty-one pens of Leicesters must be regarded as a highly creditable entry for distant Devonshire, though not all were present. Two-shear rams were a very fair class, the prize sheep of Mr. T. H. Hutchinson, Mr. D. Linton, and Mr. E. F. Jordan being good. In the shearling ram class the characteristics of the breed were well maintained, and the leading honours went to Mr. Linton. The rather weak character of the ram lamb class was somewhat redeemed by the premier pen, which showed uniformity of quality. The best class was that of shearling ewes, in which the quality was undeniable throughout.

Ootswolds.—Of these about a score of the pens were occupied, some half-dozen flocks in all being represented. Of two-shear rams there was a short entry. The shearling rams, on the other hand, were a very good entry, and the class was full of merit, Mr. Swanwick's first prize sheep being an excellent specimen. The ram lambs also were regarded by the Judges as an exceptionally good class, a Glamorganshire flock here securing the

first position. The class of shearling ewes was monopolised by Mr. George Bagnall, with some very true specimens of the breed.

Lincolns.—Twenty-five pens came before the Judges, and all the honours were divided amongst three breeders, the Nocton Heath flock securing the lion's share. There were only four two-shear rams, but all of high merit. The shearling rams were a fairly representative class of the breed, but the Judges had reason to suspect that some of the exhibits had not been fairly shorn according to Rule 54. Of ram lambs the prize pens were very good. The ewes made a small but creditable show.

Oxford Downs.—Over two dozen pens came forward, from seven different flocks. The substantial honours were very well divided between Messrs. George Adams, Albert Brassey, and John Treadwell, representing Berks, Oxon, and Bucks respectively. There was one entry from a Devonshire flock of Oxford Downs. Mr. Brassey's first prize pen of shearling ewes is selected by the Judges for special mention as being particularly good, showing both character and size. The ram lambs throughout were a very fair class.

Shropshires.—"A magnificent display" is the Judges' opinion of the show of Shropshire sheep, and that is the verdict of all who inspected the well filled classes of the West Midland breed. The 169 pens entered were diminished by some two score of absentees, but there still remained by far the biggest show of sheep in the yard. The two-shear rams, of which 20 appeared, were a fairly good class. Mr. Mansell was easily first, with a sheep of excellent style and form, his legs well put on, and a true type of the breed. The second and third prize sheep are big masculine animals of good character, though not quite perfect in their hind quarters and legs of mutton. The shearling rams made up an extraordinary class of 96 entries (22 absent), "remarkable for uniformity of type throughout, with undeniable quality of mutton." Mr. Inge's first prize sheep the Judges report as "well developed, on short legs well put on, good wool and firm flesh, but lacks style." The second prize went to a bold straight animal of true Shropshire type. The third prize was awarded for a stylish deep sheep of good character. The fact that 80 shearling rams were picked out for nominal honours is an eloquent testimony to the general excellence of the class, which contained many valuable sires. The ram lambs did not make an altogether satisfactory class, most of the pens lacking uniformity through the presence of one indifferent animal. Mr. Inge was again first. The shearling ewes, on the other hand, were a capital class, "displaying great uniformity of type and particularly good wool." Mr. George Graham's first

prize pen combined beautiful form and style with good coats. The second pen were also of choice quality.

Southdowns.—A very fair display of this breed of small joints was to be seen, 62 out of the 75 pens entered being occupied. A dozen entries were made in the two-shear ram class, the leading award in which went to Mr. J. J. Colman, M.P., for "a sheep of good Southdown type, possessing substance with quality and good wool." To this sheep was awarded the champion cup as the best Southdown ram in the yard. Mr. Toop took second prize for a ram of good size, with grand legs of mutton. The third prize went to the Duke of Richmond and Gordon, "for a sheep of good quality and pure character, but a little deficient in the hind-quarters." The shearling rams were not on the whole so good a class as the preceding one. His Royal Highness the Prince of Wales came to the front with a massive shearling, which was placed in reserve to Mr. Colman's two-shear ram for the championship. Mr. Ellis's second prize ram is a very smart sheep. Ram lambs were a rather small class, in which Mr. Ellis won easily with a good level pen, Mr. Toop's second prize pen containing lambs of great size. In a strong and good class of shearling ewes Mr. Colman was first "with a matchy pen of ewes with good shoulders and nice quality." Pens of Mr. Ellis and Mr. Toop were second and third.

Hampshire Downs.—The Hampshire breeders did not invade the West to the extent that might have been anticipated. Nine flocks were represented, and whilst one of these is located as far away as Cambridge, the county of Dorset did not send a single entry, though it deserves to be noted that an entry was made from a flock in Cornwall. In the two-shear ram class Mr. Henry Lambert's first prize sheep is wide, with great substance, and has a good head, neck, and leg of mutton. The second prize went to a bigger sheep, but "with head not masculine enough, and thighs light." The shearling rams the Judges did not regard as a good class. The first prize again went to the Babraham flock for a ram much resembling the first prize sheep in the preceding class. The remaining prizes went to Mr. Robert Coles, the second for a lengthy sheep with good dock and hind-quarters, but rather loose in fleece; the third for a smarter, level-back sheep, but too narrow and light in the thighs. The ram lambs were a decidedly useful class, the first three pens being close together in quality, and the first and second prize lambs of Mr. Frank R. Moore causing some difficulty as to relative merits. The first prize pen, however, were smarter and better matched than the second pen, which, though bigger,

were rather "throaty." Mr. John Barton's pen were recommended for a third prize. Only three pens of ewes came forward, and they "were not of special merit."

Suffolks.—These sheep had a long way to travel, so that 29 entries must be regarded as satisfactory; with the exception of five entries from Cambridgeshire and three from Essex, they all came from the home county. "This useful breed of sheep, adapted for poor hard walk lands, have much improved of late years; they are highly valued, especially in the counties of Norfolk, Suffolk, and Essex, which contain numerous large flocks that are crossed with long-wool rams, whilst hundreds of ram lambs are yearly sold for crossing with white-faced ewes. Black features, long bodies, a trifle high on the leg, with short close-texture fleeces, are their principal characteristics." These points were well exemplified in Mr. Edward Gittus's first prize two-shear ram. The second prize ram was loose in his coat and with open shoulders, but of great substance. Shearling rams were a good class, and, despite his massive character and good head, the first prize sheep was perhaps a little too short in the leg to match well with the other first prize ram from the same flock. The Marquis of Bristol's second prize shearling "was more in type, but not so wide or deep in carcass as the winner." There were other very useful sheep in this class. All the prize pens, both of ram lambs and ewes, were from the Marquis of Bristol's flock, and drew forth special commendation from the Judges, every pen being well matched, stylish, and true to type.

Somerset and Dorset Horned.—There were 17 entries, all from the adjacent county of Somerset, five flocks being represented. Last year, in the more distant county of Berkshire, the breeders of the "Horns" made 31 entries. In the old ram class Mr. Herbert Farthing's first prize sheep has good wool with plenty of substance, Mr. Samuel Kidner's second prize sheep being rather short but of good quality. For shearling rams Mr. Farthing was again first for a sheep of great substance, possessing all the characteristics of the Dorset breed. Mr. Culverwell was second with a lengthy sheep of good wool and quality, and Mr. S. Kidner third with a compact useful sheep. The shearling ewes were a class of special merit, all the five pens composing it being noticed by the Judges. The premier position was secured by Mr. Culverwell for an extraordinary pen of ewes, "with proper heads, well-shaped horns, and retaining all the qualities of the breed." Mr. John Kidner's second prize pen possessed great size and good wool, but were hard pressed by the good third prize pen of Mr. Culverwell.

Devon Long-Wool.—The breeders of these sheep made the Plymouth Meeting a strong rallying-point, there being 40 pens entered as compared with 31 at Windsor last year. The entries comprised 31 from Devon and 9 from Somerset, there being in all nine flocks represented. Sir John Heathcote-Amory proved a formidable competitor, and secured the premier awards, besides others, in the three classes. Though not numerically strong, the old rams exhibited were of superior type and quality, possessing great aptitude for fattening, and being well adapted to the soil and climate of Devon. The shearling rams were strong both in number and quality; the Judges regarded them throughout as a useful lot with superior wool. The shearling ewes were a grand class, "the whole of the exhibits being of great size and good quality."

South Devons.—This very local breed was, like the South Devon (Hams) cattle, not specifically classed at Windsor, although they there took all the prizes for the "any other breed" classes. The South Devon sheep occupy very much the same area as that already mentioned in connection with the South Devon cattle (p. 555). With the exception of one pen from a Cornwall flock, all the entries, 27 in number, came from the district indicated, there being in all half a dozen flocks represented. There were only four pens of two-shear rams, but the Judges placed them all, the exhibits being of great size with plenty of flesh and heavy fleeces of wool. Shearling rams were remarkably well represented, the entries, with few exceptions, showing superior quality and good constitution. Ewes were a smaller class, but maintained fully the size and quality of the other classes.

Dartmoor.—The local support given to the Plymouth Meeting was here again well evinced, for whilst Windsor attracted but 12 entries representing three flocks, Plymouth drew 28 entries from as many as nine flocks, all of these having their homes within the county of Devon. The whole of the old ram class were of the pure type of the Dartmoor breed, and the first and second prize sheep carried heavy coats of lustrous wool combined with massive frames. The competition in the shearling ram class was very severe, the merits of the prize-winners very nearly balancing each other. Despite the fact that the wool was, in some cases, not as heavy as might have been wished, the class contained altogether the grandest lot of Dartmoor sheep the Judges had ever seen exhibited. The ewe class brought out some good pens, and although the first prize pen were truest to their breed, the second pen, while lacking a little in lustre of wool, were remarkably well covered throughout, and the third

pen showed marked aptitude to fatten. The Judges observe that the breed has greatly improved since the Devon County and the various local agricultural associations have offered prizes for the Dartmoors, and they consider them worthy of a place in the annual prize sheet of the Royal Agricultural Society.

Exmoor.—Local effort was less successful in this case, for whereas Windsor attracted 20 entries from four different flocks, Plymouth only brought forward a dozen entries representing three flocks, located near the centres of Barnstaple, North Molton, and Okehampton respectively. The Judges "feel it a pity that the home of this breed, which for the excellence of its mutton cannot be surpassed, and which always finds such a ready sale in the best markets, should be limited to such a narrow area." The first prize ram of Sir William Williams is a grand animal, fully maintaining every characteristic of the breed. Both prizes awarded in the shearling ram class fell again to the same exhibitor, the first prize shearling being very firm both in wool and mutton, characters which so much denote a hardy constitution. A keen competition in the ewe class brought Mr. Richard Stranger to the front, although both his prize pens "bore evident marks of the trimmer's hand." A nice even lot of ewes in Mr. Lethbridge's third prize pen might have occupied a higher place if their heads and horns had been truer to the type of the breed.

Shearing.—The Inspector of Shearing (Mr. W. Jobson), who has had a very long experience in the work, reports that he found a still further improvement in the shearing of the sheep, and could not advise disqualification in any class, although there were five or six sheep he could not say were quite correct.

Pigs.

Large White Breed.—There were 50 entries of this breed. In the old boar class the two best pigs were disqualified, and as the Judges did not consider any of the remainder deserving of the leading honours at a Royal Show, they determined to withhold the first prize. In the young boar class the first prize went to Mr. Sanders Spencer for a good pen of large size and uniform quality. There were a couple of very good pigs in the second prize pen, but the other was only of moderate quality. Breeding sows were an exceedingly good class, and whilst the first prize went to Mr. Duckering for a splendid sow, the prize animals of Mr. Spencer and Mr. Strickland were also of distinguished merit. For sow pigs Mr. Spencer was first "with a remarkably even pen of pigs of fine quality." Mr. Joseph Nuttall's

second prize pen, though well grown, were of less uniform quality.

Middle White Breed.—These comprised 27 entries. Mr. Spencer was first and Mr. Twentymen was second for boars, both with good pigs. Of young boars the first and second prize pens were of very useful quality, but the Judges considered the reserve pen possessed too much of the character of the large breed. Breeding sows made a strong class of exceptional merit; the reserve and highly commended animals alone were a credit to the class. Of sow pigs the first three pens were of high merit.

Small White Breed.—There were 15 entries, the class for pens of three boar pigs being vacant. The boar class contained some good specimens of the breed. Breeding sows were a very creditable class, with not an inferior pig amongst them. Of sow pigs there were only two pens, the first prize pen containing "very good specimens of an improved small breed."

Berkshires.—Forty-three entries of this black breed were somewhat unequally distributed, the younger classes being very weak in numbers. Boars were a well-filled class, in which Mr. T. S. Minton was first for a level well-shaped pig with plenty of coat, though a trifle short on the legs. He was also awarded the champion cup, offered by the British Berkshire Society, for the best boar. Mr. Benjafield's boar and one shown by Mr. J. C. Williams ran very close to each for second place, the latter losing through being short of hair. Though not of the highest quality, there were four or five other very useful boars in this class. Four pens of boar pigs came forward, Mr. Pinnock's being uniform and of very superior quality. The breeding sows made so good a display that the whole class was commended. Mr. Fricker took first prize and the champion cup. "Whilst not so fat as the second and third prize animals, his sow carried a great weight of natural flesh and was a model Berkshire from every point of view." Mr. Hayter's grand young sow had lost part of her coat. Mr. Lawrence's young sow was neat and of good quality, and though rather fat for breeding purposes she was nevertheless active. Three or four promising young sows followed these, and two or three very good older ones. Of sow pigs only three pens were occupied, and none of these were perfectly marked.

Any other Black Breed.—These pens were chiefly filled from local herds, but in the young boar class the red ribbon was carried away to the East of England. The old boar class attracted 11 entries from Devon and Suffolk, and though the first and third prizes went to the former county, the Duke of

Hamilton and Brandon secured the second prize. The class was filled with uniformly good animals, and half a dozen besides the prize winners received notice. The young boars were a weak class—only two entries, and these not of special merit. Breeding sows made by far the grandest class in the Show, and so even were they in shape, size, and quality, that, had the twelve best been absent, the Judges would not have hesitated to give the thirteenth substantial honours. All the prizes fell to Mr. W. S. Northey, whose entries, compared with some of the pens, showed more inclination to acquire size. Nevertheless, Mr. Pettit, the Earl of Portsmouth, the Duke of Hamilton and Brandon, and Mr. Collier all had capital entries, and the whole class was noticed. Sow pigs were another short entry of three pens, of which the Earl of Portsmouth's were placed first.

Tamworths.—There were 53 entries, and the breed has seldom or never been better shown. The awards will be best studied in the light of the following observations of the Judges:—

"The Judges of the Tamworths at Windsor last year remarked in their report that it seemed advisable for only one type to be adopted as far as possible by all the Tamworth breeders. This recommendation has been taken up by the leading breeders, and certain points indicating the breed have been brought prominently forward by those interested. It was to be expected that, under the circumstances, slight exceptions would be taken to some of the decisions. The judging was, however, fairly carried out on the lines intimated, and it is hoped that greater uniformity in future entries will be carried out. We considered the sow classes to be nearer the required type of the breed than the boars; so much so that, after careful examination, we decided to commend the whole class of breeding sows and the whole class of pens of three sows."

POULTRY.

All three Judges in this Department (Mr. Bragg, Mr. Cresswell, and Mr. Leno) speak in high terms of the quality of the exhibits brought before them.

The main object of the Society in offering prizes for poultry is to encourage agriculturists to devote greater attention to an industry which fits in very well with ordinary farm operations, and is often, under skilful management, a source of considerable profit.

Certainly the Poultry tent, which has now been a feature of the show for the last five years, has been a great attraction to visitors, and Mr. Bragg is of the opinion that, judging from the chickens and ducklings exhibited in most of the leading varieties, the Royal Show is undoubtedly stimulating poultry breeders with a greater desire to produce early youngsters.

"This [he says] will tend greatly to supply a long felt want in our markets of good table chickens during the early months of the year. In my experience

out of every ten pure-bred chickens successfully reared only one is suitable for a 'Fancier's' exhibition, whilst the remainder are exclusively and admirably adapted for the market and the table. From March to July in each year most of our market towns are very inadequately supplied with good chickens and ducklings.

"It must be most gratifying to the promoters and well-wishers of this department, to notice what a centre of attraction the Poultry tent was to the visitors during the week. The appreciation of the information and instruction to be gained here by an agricultural community is bound to lead to the extended cultivation and value of commercial poultry, and encourage many who have the accommodation to supply our home markets more plentifully, and assist in retaining in this country some of the millions annually paid to the foreigner for poultry and eggs."

In order to prevent the Poultry Department of the Show from becoming a mere contest amongst fanciers, the Judges are each year distinctly instructed to give greater consideration to "high condition, quality, purity of race, and weight," than to "mere beauty of plumage without these distinctions." The Judges report that they were careful to keep this instruction in view; and some remarks of Mr. Cresswell on the general question are worthy of reproduction:—

"The great increase in the number of entries of many breeds of poultry, and the still more striking improvement in the quality of the exhibits, is, I am sure, largely due to the change in the management of the Show. The adoption of the usual Show pens, and of the entry of single birds, has brought to the Show the choicest specimens of many of the most skilful breeders and fanciers. I do not mean that from the point of view of the R.A.S.E. (nor in my own judgment) fancy points and fancy characteristics should have great weight; but it is a well-known fact that the pioneers of improvement in the breeding of poultry, as in that of other live stock, have always been those who brought to their occupation the enthusiasm of fanciers. While, therefore, I think that useful qualities should first of all be considered, I am equally convinced that those who as fanciers keep up and improve pure and distinctive breeds of poultry should not be discouraged."

Viewing the Live Stock generally, Mr. T. H. Miller, Senior Steward of this department of the Show, who now retires after officiating as Steward of Live Stock at the last four Meetings, points out that only in the Horse Classes was there any deficiency in numbers. In Cattle, Sheep, and Pigs the entries compare most favourably with the entries of the seven preceding years (see Table, page 542), excluding Windsor, and are far in excess of the averages of those years. The entries of Poultry were more than four-fifths of the numbers at Windsor. Comparing the two Meetings of 1890 and 1865, Mr. Miller notes that whilst the entries of Live Stock have more than doubled, and the money given in prizes has been increased by 62 per cent., the attendance has only increased by about 11 per cent.

WOOL.

This was really a local display, the entries being of three fleeces in the four classes of Devon Long-wool, South Devon, Dartmoor, and Exmoor. The wool was to be of the clip of 1890, and to be shown in the grease. Only one class (the Devon Long-wool) filled at all well, there being 11 entries. Taken as a whole, the entries, especially the winning (Mr. A. C. Skinner's) and other noticed lots, "were of good length, texture, and style, well grown and well managed, but in some of the exhibits quality had been sacrificed to some extent in a desire to increase the size of the fleeces." The four entries of South Devon wool were all excellent in colour, length, and strength; the fleeces were of great size and the wool well grown, though the quality might have been better. "The breeders of this class of sheep would find it advantageous to improve the *quality* of the wool without losing its special style." Of Dartmoor wool there were five entries, four of which were good typical lots, and fully demonstrated the great weight of wool this breed of sheep now carries. The wool was of good colour, style and quality, and well grown. Exmoor wool was represented by two entries from the same flock, both good in quality and style.

CHEESE.

There were 53 entries in this section. Of last year's *Cheddar*, 10 entries came forward, and the three prize lots the Judges report to be of quality fit to stand against any cheese in any market. Last year's *Cheshire* made a small but useful class. Last year's *Stilton*, 11 entries, was on the whole a class of fine quality; the first and second prize lots would be difficult to surpass. *Cheese of any British make*, made this year, attracted a score of entries, which, as a whole, were not up to the standard of the Royal Show, though the first and second prize lots, both out of the *Cheddar* country, were considered to be very good. In the *Cream-cheese* class the quality left much to be desired.

The Judges strongly urge closer application on the part of cheese-makers, and add that a deeper and keener interest should be evinced by larger numbers of farmers who depend in a greater or less degree upon cheese-making for the payment of rent and for other outgoings. They suggest a class for new cheese, made in factory or otherwise, ready for summer use, in cheeses of about 30 lb. each.

BUTTER.

This was a large display—183 entries in five classes. The Judges speak approvingly of the arrangement, the samples being covered with glass after judging, and provision made for the use of ice in keeping the butter firm should the weather render it necessary. This plan is carried out on a large scale at the Danish National Show.

Although the lack of quality in the class of fresh butter, absolutely free from salt, rendered it difficult to apportion the two sets of prizes—five of 5*l.* and five of 3*l.*—this system, which practically means the separation of ten samples into two classes, the Judges found to be an excellent one, notwithstanding the fact that they found but one sample worthy of being regarded as highly meritorious.

“The majority of the samples in this class were mild, but their flavour was not exactly that of the finest butter. In some instances the exhibits were made from clotted cream, although a class was provided for butter made upon that system; in others, but these were fortunately few, the butter was either very badly made or very disagreeable in flavour.”

For fresh butter, slightly salted, all the first prizes were awarded, the samples being more generally excellent than in the preceding class. This may possibly have arisen from the employment of salt, for traces of the “off” flavours so discernible in the former class were not noticeable. The majority of the exhibits were extremely well made.

The quality of the butter made from scalded cream was generally good. In some cases smoky and lardy flavours, and in others curd, were obviously detected, both by roughness and by taste, but no sample was forthcoming in which the flavour conveyed by the scalding process was absent.

The class for whey butter was a failure, only three entries coming forward. The first prize sample was like average tub butter, the others were inferior. In view of the fact that good butter has been made—and can be made—from whey, the Judges recommend that this class be repeated.

The class for kegs or packages of salt butter included some excellent samples. “All the prize butters, and one or two others, were mild, and decidedly superior to the best brands of ordinary tub butter sold in the market.” It is suggested that this class also might be repeated.

CIDER AND PERRY.

Of 61 entries in this section five were perry and the rest cider. The struggle between Devonshire and Herefordshire resulted

rather in favour of the latter, though the local entries were by far the more numerous. Of cider in cask made last autumn but few entries were worthy of notice. "It is to be regretted that so many exhibits were in stinking casks. Lack of good management excluded what might have been really good, sound, and palatable cider from a chance of a prize." The bottled cider made last autumn was—probably owing to the poor apple season of 1889—none of it of first-class character. "No sample was *thoroughly* clean and free from dreg or apple pulp. Many exhibits had no vigour whatever—a desideratum in *bottled* cider." No first prize was awarded. Bottled cider made in any year before 1889 comprised but few inferior exhibits, nearly all being good, sound, and reliable cider. The Judge points out that makers *must* grasp the fact that "doctored" cider or perry is becoming too well known, and that really good, palatable, and valuable cider can be made from the pure apple juice alone.

JAMS AND PRESERVED FRUITS.

With the exception of the entries of the Earl of Coventry from the Pershore Jam Factory and of Messrs. Saville & Sons, the jams were of poor quality, some being insufficiently boiled. The fruit jellies were so inferior that the Judge was unable to award a prize. There was a solitary entry of bottled fruits, which being of average quality was awarded a first prize.

The entries in these classes were disappointingly few, but the Council have thought it best to continue the prizes for another year, in the hope that more competitors may be induced to come forward and to take an interest in jam making.

HIVES AND HONEY.

After expressing gratification at the interest shown in agriculture by the "Royal" and other leading agricultural societies, the Judges remark that "not only has honey now received recognition as a farm product, but the importance of the work performed by bees as fertilisers is better understood and appreciated by both the fruit-grower and the farmer; several extensive fruit growers being producers and exhibitors of honey. "Beyond this, the 'industrious little labourer, the honey bee,' is no longer merely tolerated by the farmer, but is welcomed by the most intelligent members of the farming class for the substantial advantages resulting from its labours in fructifying the blossom of field and orchard, and it is hoped that the dairy farmer as well as the fruit grower will soon make honey production a regular item of his trade."

The following are the detailed observations of the Judges upon the exhibition in the Bee Department at Plymouth:—

"It was feared that the remoteness of the district in which the Show was held might have an adverse effect on the number of entries for bee-hives and appliances. To some extent this was the case; but we were agreeably surprised to find how great was the amount of interest taken in the appliance section of the Bee Department by Devonshire people, as evinced by the specially good attendance on the popular days of the Show, while the visitors kept such beekeepers as were present fully occupied in replying to their eager inquiries for information on bee matters.

"In the classes for hives the schedule had been modified this year, apparently to meet the objections entertained by manufacturers against working to a fixed specification and price—the two classes for hives being now simply defined in the one class, as 'the best and most complete frame hive for general use,' and in the other as 'the most complete and inexpensive frame hive for cottagers' use.' We are of opinion that these concessions are wise ones, leaving, as they do, the manufacturer free to exercise his inventive skill in producing what he considers to be the best hive, while perfectly unfettered as to form, price, or in any other way.

"In the class for Extractors, Mr. Meadows showed that he is still bent on introducing every possible improvement which skill and thought can suggest in the well-known types of machine so entirely his own—the latest 'idea' in the 'Raynor' being to do away with the tin backing of the revolving cage, so that the honey is now thrown directly against the sides of the cylinder, and thus the cage is at once relieved of the weight of the honey as the comb revolves. The same maker also introduces his new lock-tap valve on all his machines.

"There was a good entry in the honey classes, and, had the fine weather of the early bee season not come to so abrupt a conclusion as it unfortunately did, a very excellent display of this season's honey would have been staged, several large exhibitors who had entered being perforce compelled to leave their unfinished exhibits behind. A very fair quantity of this year's honey, however, was staged; and, seeing that it was gathered in so short a time (scarcely more than one week), it gives a full assurance that nothing but a few weeks of fine weather at the proper time is needed to ensure for the bee-keeper as well as for the farmer a satisfactory return for his labour and outlay.

"Mr. Roland Green, of Rainham, had charge of the manipulating tent, and lectured to very large audiences every day of the Show."

THE BUTTER-MAKING COMPETITIONS.

The Dairy, at which these competitions were held, and daily demonstrations of the processes of butter-making were given by Miss Maidment and her assistants, is highly spoken of by the Judges, who expressed their warm approval of the plan of providing apartments at the back, reached by a passage from the centre of the dairy, for the weighing of the cream, the storing and cleaning of implements, and other purposes.

Class 1—for dairymaids who had won a prize at any Show—brought forward six competitors, one of whom used clotted cream which she stirred into butter with a wooden hand,

completely spoiling the whole. Diaphragm, Endover, and triangular churns were used, 20 lb. of cream yielding from 6 lb. to 6 lb. 8 oz. of butter, with the exception of the clotted cream, which furnished 14 lb. 7 oz. The judging was by points, and the five competitors who were awarded prizes all obtained high marks for quality, for skill in churning and making up, and for cleaning the utensils, one or two falling short only in the rapidity and general smartness with which they worked.

Class 2 was for dairymaids who had never taken a prize; and here again six competitors came into the Dairy. Of these, three used 10 lb. of clotted cream, which they worked into butter with the bare hand, at a temperature of 62° Fahr. Each used a very large quantity of salt, which was not weighed. In two out of the three cases the butter was firm and mild, weighing from 6 lb. 12 oz. to 7 lb. 11 oz.; it was all made up by hand and constantly beaten on the bottom of the tub, in which it had been frequently stirred with large quantities of cold water. The rest of the competitors used, as in the preceding class, 20 lb. of raw cream, churning with the Endover and the Charlemont at 55° and 58° Fahr. Excellent butter weighing 5 lb. 13 oz. to 5 lb. 14 oz. was produced in from 25 to 33 minutes, the grain being all that could be desired. These competitors, who were very equal, obtained high marks for quantity, quality, skill in churning and making up, and for cleaning utensils; but they were slow in their work and evidently not so practised as those who have been frequently in competition. Two of the three obtained equal marks and were bracketed first.

Whilst thinking it would have given greater satisfaction had there been a class in which the local system could have been adopted, the Judges are strongly of opinion that the use of the hand should be rigidly excluded.

DAIRY APPLIANCES.

The Implement Classes 5 to 9 were allotted to Dairy Appliances entered for competition. In Class 5—"strong dairy thermometer, with broad mercury column, to float upright in milk or cream at about 40° Fahr., and to be scaled in a very bold clear manner from 40° to 120° Fahr."—the exhibitors as a whole did not appear to recognise the fact that the scale indicated is sufficient for all dairy purposes. As a consequence, the lines were too close to be of much practical use, and in some of the instruments one space was made to serve for two degrees. The Judges regard it as of importance that a thermometer should be provided with wide spaces, bold lines, and a still bolder column

of mercury, the scale from 40° upwards standing in the vertical instrument as high above the milk as possible. It is also important that the glass should be exceptionally strong and as much protected as practicable. Some of the thermometers which were entered indicated inaccurate temperatures. The prize was awarded for an instrument that was fixed between two metal barrels floating horizontally; it could also be used in a vertical or in an inclined position.

In Classes 6 and 7, for non-returnable parcel-post boxes to carry butter, the prizes were awarded for strong cardboard boxes bound at the angles with metal clips. The boxes appeared to be sound, clean, and free from any disagreeable smell. 1 lb. boxes cost 6s. 9d. per gross, 2 lb. and 3 lb. boxes 7s. 9d., and the larger sizes are proportionately moderate in price.

Class 8, "vessel to contain preserved butter, closed hermetically, without the use of solder," drew forth but one exhibit, this being an admirably made wooden keg, which, however, the Judges considered too heavy and expensive for general adoption. No prize, therefore, was awarded.

In Class 9—"sieve or sile for use in a dairy"—there were several sieves or strainers. No award, however, was made, the Judges being of opinion that in no instance did the appliance conform to the requirements of a good dairy. Most of the strainers were provided with brass wire gauze, either at the bottom, at the side, or in the form of a cone raised above the bottom. Gauze is objectionable, as it is easily clogged and soon wears out. When the dirt strained from a pailful or two of milk has collected, the succeeding milk necessarily passes through it unless it is cleaned, and this cannot always be done in a moment. Moreover, the strainers were adapted either for the railway milk churn, or for the cheese vat, and in no instance for both, or—as they should have been—for cheese-making, butter-making, and milk-selling. The Judges considered the simplest and most practical system of straining to be that adopted by Mr. Pond (No. 907), in which an ordinary strainer cloth was simply fitted between the two boards of a metal cheese strainer, but the appliance was not adapted for any other purpose than that of the cheese vat.

THE HORSE-SHOEING COMPETITION.

The Royal Agricultural Society has, during the last four years, done its best by competitions of shoeing smiths in its Showyards to encourage good farriery throughout the country, and the official reports of these competitions, which have

appeared in the Journal, indicate very clearly that there is great room for improvement in horse-shoeing as at present practised. The competitions have been followed with the utmost interest by visitors to the Shows, and by fellow-craftsmen of the candidates, and it cannot be doubted that their practical and educational value has been very great. The Society has not been unmindful in the past of the importance of horse-shoeing, and an article on the subject appeared in its Journal so long ago as 1857, from the competent pen of Mr. W. Miles; followed in 1881 by a paper by Dr. George Fleming, the principal veterinary surgeon of the Army, and in 1888 by a practical treatise on the structure of the horse's foot, and the principles of shoeing, by Professor Brown, the professional adviser in the Veterinary Department of the Board of Agriculture and the Principal of the Royal Veterinary College. But, undoubtedly, the object lessons given by the competitions at the Shows of the Royal and other Agricultural Societies have greatly assisted to attract the sympathetic attention of the public to the efforts which are being made to secure the shoeing of our horses on scientific and humane principles, for every one who uses his eyes can see for himself in these competitions how very much the present methods of shoeing-smiths leave to be desired.

At the first competition of smiths held by the Society at its Newcastle Meeting (1887), at the suggestion and under the stewardship of that staunch friend of the cause, Mr. Charles Clay, there were 42 entries, divided into four classes, viz. agricultural horses, dray horses, hunters, and roadsters, and 64*l.* was offered in prizes. The following year, at the Nottingham Show (1888), the sum of 32*l.* for prizes was given by the Society for a horse-shoeing competition, but in two classes (hunters and agricultural horses) instead of four. At this Show, at which 58 smiths competed, the Worshipful Company of Farriers first became associated with the Society by presenting the Freedom of their Guild to the first prizeman in each class—an honour which has been highly appreciated by the recipients. At the Windsor Show last year the sum of 42*l.* was devoted to a shoeing competition in two classes (draught horses and harness horses), and the whole of this prize money was generously provided by the Worshipful Company of Farriers, in addition to the Freedom of their Guild to the first prize-winner in each class. For the Plymouth Show, the sum of 42*l.* was offered in prizes for two classes (hunters and agricultural horses), and there were 29 entries, the Farriers' Company again offering the Freedom of the Company to the first prize-winner in each class, and also giving the first prize in each class.

Mr. Clay, who acted as one of the Judges on this occasion, reports that in the hunters' class, in which 22 candidates appeared, the competition was very close, especially for the second prize. The time, however, all through was far too long and varied—from 32 to 73 minutes to perform the same work. The first prizeman was fully entitled to his position as a practical shoeing smith, and his work altogether, both as to the form and finish of the shoes, the treatment of the hoof, and the fitting on of the fore shoe, was quite equal to anything which has come under Mr. Clay's notice during an experience of eighteen years in these competitions. The knowledge of the first prize-taker as to the internal parts of the horse's foot was, however, not so perfect, and on this point Mr. Clay hopes that the Registration Committee of the Farriers' Company will not overlook the great importance attaching to this branch of the question when they get their Provincial Committees to work throughout the country. In Class 2, where only 7 competitors appeared, the work was, of course, not equal in finish and style to that with the hunters; but still the importance of having good useful shoes, not too cumbersome for an ordinary farm horse to carry about, well fitted on, with not too many nails, and without cutting and rasping the feet to pieces, is yet far from being looked upon as requiring care and intelligence to do the work properly.

It is further remarked by Mr. Clay that, in his own opinion, the new scheme of the Farriers' Company, in the carrying out of which the Society is now co-operating, appears a more permanent and satisfactory means of improving the art of shoeing than the holding of competitions in the Royal Showyard, whilst the immense difficulty of procuring horses for shoeing competitions—a difficulty great in proportion to the number of competitors—prevents anything like a national competition, or even one which can be thrown open to the whole of the district in which the Show is held. What he thinks the "Royal" might possibly do now would be to offer some sort of Champion Prizes for the first and second winners at their own and the leading local Societies' competitions, for, say, the past five or six years, and by that means arrive at a standard of perfection for the country generally.

As the form of Judges' Book used at Plymouth may be some guide to those intending to institute similar competitions, it is shown on the opposite page. The value of the points may be varied to suit each Judge's own opinion; but this form was found to answer the purpose very well at Plymouth, and saved the Judges much trouble in making their final decision.

[Left-hand page.]

Prizes Awarded	No. of Entry. ¹	NAMES AND ADDRESSES OF COMPETITORS ²	Time Starting	Time Finishing	Time Occupied

[Right-hand page.]

Taking off Old Shoe. 2 Points	Foot Dressing, &c. 6 Points	Forging and Form of Shoe. 4 Points.	Nailing and Fitting on. 4 Points	General Finish. 4 Points	Total Points 20	REMARKS

The following Report by the Judges (Messrs. Clay & Barford) on the details of the competition will be interesting :—

"The competition this year was divided into two classes, for hunters and agricultural horses, the former class having 22 entries and the latter only 7. We are quite agreed that the work brought before us was a decided improvement on that at Newcastle, for we find an almost entire absence of those objectionable practices—the too free use of the rasp and knife, and a general desire to leave the frog in its entirety. Taking Class I. as a whole, the shoes were well fitted, and in doing so they were not applied to the foot in too hot a state. At the Oral Examination, which took place afterwards, quite two-thirds of those examined had taken the trouble to investigate the internal structure of the foot and make themselves acquainted with the respective parts and their uses, and altogether the answers of the competitors, with some exceptions, were a decided improvement on former years.

"It is much to be regretted that in a town like Plymouth, surrounded as it is for the most part by a general farming district, there should have been only seven competitors in Class II. (agricultural horses)—especially when we consider the very liberal prize list issued by the Society. The shoes in this class were, as a rule, fairly fitted; the heels in one or two instances being too long and the foot not very well prepared.

"Taking the work in both classes as a whole, we consider it creditable to the district, for on reference to the Judges' book we find that in the class for hunters almost half the competitors obtained 18 or 19 points out of 20, showing that the work altogether was decidedly above the average. In the class for agricultural horses the total number of points was not so high."

CONCLUSION.

That, from an agricultural point of view, the second Plymouth Meeting was a success is beyond all doubt. As remarkable sections in the several departments of live stock may be mentioned

¹ The number of entry corresponds with the number in the Catalogue.

² Three lines are allowed for name and address for each competitor, leaving thereby ample space for the memos. under each of the columns.

the Suffolk horses, the Kerry cattle, the Shropshire sheep, and black pigs other than Berkshires. The last-named were of high local interest, as the groups of visitors around their pens served to show; the same may be said of the South Devon cattle and sheep. The Poultry tent came in for an extensive share of patronage, especially on the days of popular prices, whilst the Dairy attracted at times inconvenient crowds. Not less was this the case with the Bee Department, which was resorted to by many who wished to learn. One other section—a very important one—demands a word, and that is the Trial Yard. It was to be found behind the shedding on the right of the entrance, and here the Judges of Implements were for many days engaged in the difficult and dusty work of deciding upon the relative merits of portable motors, of grist mills, and of disintegrators.

Remote as Plymouth is from many of the great centres of population, none who visited the South Devon coast in June will have carried away other than an agreeable recollection of a successful gathering. The Meeting was throughout both harmonious and pleasant—qualities that are in themselves in no small degree conducive to success. By fixing its Country Meeting for an earlier period than was the case previous to last year, the Society would seem to have struck a vein of fine weather, which all its well-wishers will hope may prove inexhaustible.

THE TRIALS OF LIGHT PORTABLE MOTORS AT PLYMOUTH.

THESE trials were arranged to afford data for the award of prizes offered by the Society for Light Portable Motors, as follows:—

Light portable motors, steam or other, up to five brake-horse-power:—

(a) Motors using solid fuel (including steam engines and hot air engines).
First Prize, 30*l*. Second Prize, 20*l*.

(b) Motors using liquid or gaseous fuel. First Prize, 30*l*. Second Prize, 20*l*.

Judges.

DAN. PIDGEON, C.E., Walsingham House, Piccadilly, W.

Prof. URWIN, F.R.S., 7 Palace Gate Mansions, Kensington, W.

The following is a list of the competing engines, together with the conditions of trial:—

No. in
Catalogue

(a) *Motors using Solid Fuel.*

- 3487 Adams & Co., Cattle Market Road, Northampton. Vertical Steam Engine, and Boiler, price 115*l*.
3492 Simpson, Strickland, & Co., Dartmouth, Devon. Light Portable Engine, Kingdon's Patent, price 100*l*.
3496 E. R. & F. Turner, St. Peter's and Grey Friars' Works, Ipswich. Steam Engine, Vertical Portable, price 84*l*. 5*s*.

(b) *Motors using Liquid or Gaseous Fuel.*

- 3183 Brown & May, North Wilts Foundry, Devizes. Portable Paraffin Engine, 1-Horse power, Knight's Patent, price 100*l*.
3513 Priestman Brothers, Limited, Holderness Foundry, Hull. Oil Engine, 5-Horse power, price 235*l*.

CONDITIONS OF TRIAL.

The trials of these engines will be generally similar to previous trials of steam engines by the Society. The indicated and brake-horse-power will be ascertained; the fuel and water consumption per horse-power will be measured, and due attention given to general design, excellence of workmanship, and uniform working of the engine.

The adaptability of each engine for general purposes on a farm will be considered, especially as regards simplicity of design, strength, and durability.

Engines indicating beyond five brake-horse-power will be disqualified.

The following will be the points awarded in each of the two classes, *a* and *b* :—

1. Cost	15
2. Simplicity, workmanship, and durability	15
3. Lightness of weight combined with strength	5
4. Governing power	5
5. Facility of transport	10
6. Fuel	15
7. Water consumption	10
8. Efficiency	15
9. Economy in getting to work and attendance	10

100

In the first sub-class three steam engines were entered for competition. Two were single cylinder inverted engines with vertical boilers. The third was a tandem compound inverted engine with a vertical tubular boiler. It is very disappointing that so few engines were entered. Amongst the three engines submitted to them, the Judges had no difficulty in deciding the order of merit; but it may be confessed that it would not be difficult to indicate how an engine might have been built which would easily have been placed higher in order of merit than any of those exhibited. It is also perhaps to be regretted that no hot air engine was placed in competition with the steam engines. Under the terms of the competition, a hot air engine of 1 or 2 horse-power might have been entered, and the comparison of

its performance with that of the steam engines would have been interesting.

In the second sub-class, a gas engine was entered by Messrs. Crossley, but was withdrawn before the trials commenced. This is hardly to be regretted. The performance of gas engines is now well understood, and nothing new could have been learned from another trial. Whether a gas engine can properly be regarded as a portable motor is open to question, and there would have been difficulty in fairly deciding between the merits of gas and petroleum engines. The fact is they do not properly come into competition as portable motors. Where gas is obtainable from gas mains, a petroleum engine would hardly ever be used, and where gas is not obtainable, only a petroleum engine would be used for the intermittent kind of work required of an agricultural engine. The petroleum engine, in fact, is rather a competitor with steam engines of small size than with gas engines.

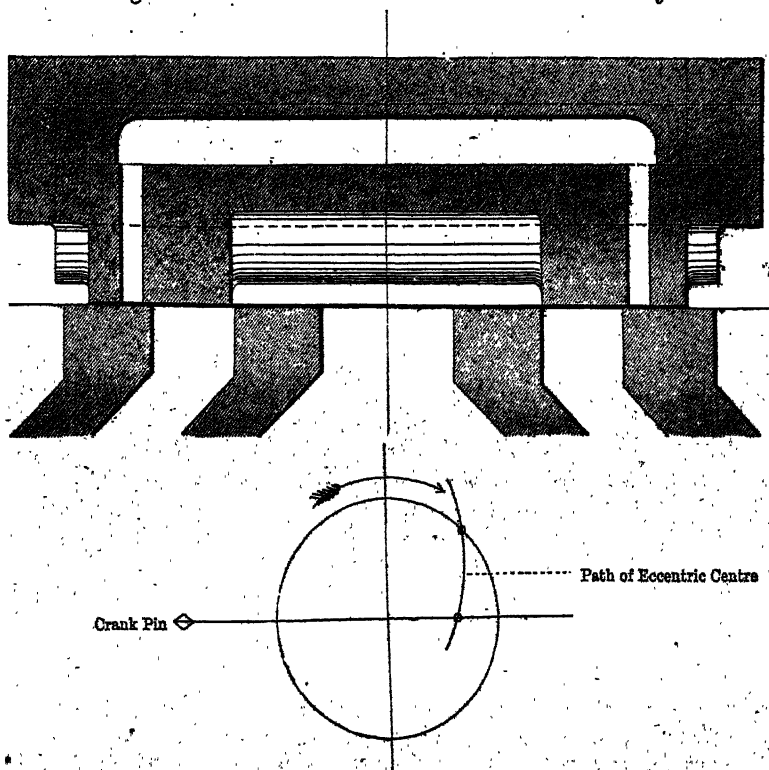
STEAM ENGINES.

General description of the Steam Engines entered.—The engine of MESSRS. SIMPSON, STRICKLAND & Co. (First Prize, 30*l.*) was a small comparatively fast-running compound engine (Kingdon's patent). The compounding is of a very simple kind and involves no special complication or extra working parts. The cylinders are tandem, and the peculiarity is that a single slide valve regulates the admission and exhaust for both cylinders. The cylinders are cast in one, without jackets, and clothed with silicate cotton and sheet steel. There is no stuffing box between the cylinders, but the piston-rod connecting the pistons is grooved; and this in the makers' opinion insures sufficient steam tightness. The engine had no governor, and was regulated during the trial by hand, the speed being very irregular. In ordinary work no doubt a governor would be necessary, and its absence may be noted as a not unimportant defect. However, as a governor could apparently be added without difficulty, there appeared no reason for allowing the defect of the engine in this respect to override all other considerations, or to disqualify the engine.

The boiler was a small vertical boiler with rather closely packed vertical tubes. There were 156 tubes (brass), 2 feet 3 inches long and 1 inch outside diameter. These tubes give sufficient heating surface in a small boiler, and as they pass up through the steam space the superheating surface is not inconsiderable. Probably a very distinct advantage in economy was derived from the drying of the steam by the upper part of the

tubes. The boiler had a direct spring loaded safety valve. The boiler is ordinarily fed by an injector, but as this was arranged in connection with a tank so that measurement of the feed was impossible, it was fed during the trial by a hand pump with which it was provided. To work this hand-pump during the trial, an extra attendant who did nothing else was permitted.

Fig. 1.—Trick Valve. Messrs. E. R. & F. Turner's Engine.



Section of Slide Valve and Port Face. Full Size. Maximum Stroke of Eccentric Centre $1\frac{1}{2}$ inch.

The mounting of the engine as a portable engine was of a rather rough and ready description, but here again the defects were of a kind easily remediable.

Messrs. E. R. & F. Turner's engine (Second Prize, 20l.) was a small inverted single cylinder engine, with a Y-shaped frame carrying the crank shaft below, the framing being attached to the boiler by a wrought iron elastic plate. The engine is known as

the Gippeswyck, and is mechanically well designed. The valve gear consists of a Trick valve driven by a single eccentric, forming part of a Turner Hartnell governor. There is with this gear an automatic variation of the stroke of the slide valve corresponding to variations of load on the engine. The arrangement is an excellent one, and the governor acts extremely promptly and well. The valve gear was not, however, very well set for the trial, the release being decidedly too early. The effect of this on the economy of the engine was, nevertheless, probably not very great. In fig. 1 is a sketch of the Trick valve. The cylinder was covered with hair felt, cased in sheet iron, and all the steam pipes and exposed parts were well protected from radiation. There was an ordinary plunger feed pump with an adjustable valve so arranged that the feed could be pumped direct into the boiler, or returned through a nozzle into the feed tank. Round this nozzle a portion of the exhaust steam circulated so as to heat the feed with the waste steam. It was necessary during the trial to cut off the feed heater, otherwise the consumption of steam by the engine could not have been ascertained. But a special experiment was made to ascertain how much heat could be saved by the use of the feed heating arrangement. The addition of the feed heater involves little expense, and it is a very sensible arrangement.

The boiler was an upright boiler with a high fire-box, from which thirty-six $1\frac{1}{2}$ -inch tubes led horizontally into the smoke-box. The boiler was somewhat small for the work done in the official trial run, and there was some evidence, from the wetness of the indicators and the large cylinder condensation, that the boiler might have supplied wet steam. The boiler was provided with a lock-up, and a lever and spring balance safety valve. It was very well clothed, more care being taken to prevent radiation than in any other engine tried. The engine and boiler were mounted on an iron four-wheeled truck in a very workmanlike and satisfactory way.

MESSRS. ADAMS & Co.'s engine was a vertical inverted single cylinder engine, with a spring loaded governor acting on a throttle valve. The valve gear consisted of an ordinary slide valve and single eccentric. The governor could not be used during the trial, as one of its brackets fouled the indicator gear. The boiler was a vertical boiler with inside furnace, having two cross tubes $6\frac{1}{2}$ inches diameter and 2 feet 6 inches long. There was a very small amount of superheating surface from the chimney passing up through the steam space. The heating surface for the size of the boiler was very small. The boiler was entirely without clothing, and no doubt the radiation loss was not incon-

siderable. The temperature in the chimney towards the end of the trial was very high, showing very great loss from inadequate heating surface. The boiler had double safety valves with weights and levers.

General dimensions of steam engines tested	Simpson, Strickland & Co., Dartmouth	E. R. & F. Turner, Ipswich	Adams & Co., Northampton
Catalogue No.	3492	3496	3487
Nominal horse-power	3	2½	5
Weight, empty, in cwt.	16	36½	54
Price	£100	£87 15s.	£115
<i>Engine</i>			
Diameter of cylinder, inches . . .	{ 3·012 5·999 }	4·496	7·010
Stroke, inches	6	7·5	10·0
Effective area of piston, square inches:—			
Top	7·13	15·876	38·60
Bottom	6·69	15·275	37·36
L.P. top	27·82	—	—
„ bottom	27·46	—	—
Clearance, cubic inches	{ 12·88 26·60 }	18·7	[45·6] ¹
Declared steam pressure, lb. per square inch	120	65	75
Declared revolutions per minute . .	300	220	140
<i>Boiler</i>			
Grate area, square feet	2·4	2·63	4·7
Total heating surface, square feet .	65·3	34·5	45·9
Superheating surface, square feet .	25·2	—	—
Weight of water at normal level, lb.	373	—	—

¹ The clearance was given by the makers as 20 cubic inches. But the diagrams show it must have been much greater than this. It has been taken in calculation at 12 per cent. of the cylinder volume.

Mode of carrying out the trials.—For the purpose of the trials each engine was provided with a flat rimmed pulley on which a rope brake was arranged, having a dead weight at one end and a spring balance at the other. The pulley, under the advice of the Society's Engineers, had in all cases been made with a trough-shaped rim² in which water could be placed. The dead load was kept constant throughout the trial, and the spring balance read every ten minutes. The makers had also provided indicator gear, that of Messrs. Turner being quite satisfactory, while that of Messrs. Adams was too crude to be quite trustworthy. The diagrams throughout the trials were taken very

² A plan first adopted by Mr. Druitt Halpin.

carefully by Mr. Anderson with Crosby indicators. The feed was in all cases measured by weighing.

For the purpose of the trial a supply of Powell-Duffryn Welsh coal had been provided, and this was given in weighed quantities as required to each competitor. Samples of this coal taken at intervals during the trials were sent to Mr. Charles J. Wilson for analysis, with the following results:—

*Analysis of Coal received from Messrs. Easton & Anderson,
June 28, 1890.*

Moisture	1.01 per cent.
Ash	4.73
Carbon	84.87
Hydrogen	4.38
Sulphur, nitrogen, oxygen, &c.	5.01

100.00

Heating value—

$$0.8487 \times 8,080 = 6857.5$$

$$0.0438 \times 29,000 = 1270.2$$

8127.7

Evaporation in lb. of water per lb. of coal $\frac{8127.7}{537} = 15.13$, or deducting weight of moisture present, evaporation per lb. of coal as used in the trials, 15.12.

The coal was therefore of excellent quality.

Before commencing the trials the brake load was adjusted to give as nearly as might be the horse-power which the exhibitor thought best. The engine was then kept running steadily for some time, with the brake on, and the fire regulated to keep the pressure constant. Just before beginning the trial, the charging of fresh fuel was stopped till the pressure gauge showed a slight fall. Then the condition of the fire and water gauge was noted and the trial commenced. The steam pressure was kept very constant throughout the trials. Some time before the end of the trials the fire was cleaned, and it was brought at the end of the trial to the same condition as at first.

The feed was also regulated at the end of the trial, so that the level in the gauge was the same as at the beginning.

DISCUSSION OF THE RESULTS.

The Boilers.

The portable steam motor consists of two parts, and it is obvious that it is necessary to distinguish the efficiency of the boiler and the engine. The motor may have had a good boiler and

Results of the Trials	Simpson, Strickland & Co., Dartmouth, 1st prize	E. R. & F. Turner, Ipswich, 2nd prize	Adams & Co., Northampton
Duration of trial, minutes . . .	240	210	174
<i>Boiler</i>			
Mean steam pressure above at- mosphere, lb. per sq. in. . . . }	101.4	60.60	75.00
Mean steam pressure absolute . .	116.2	75.43	89.76
Mean temperature of feed Fahr. .	63.16°	62.4°	57.5°
steam Fahr.	339.0°	308.3°	320.2°
Rise of temperature of feed due } to feed heater }	7.7°	74°	none
Coal used, lb.	92.5	153.25	173.75
Water evaporated, lb.	807.0	1,172.5	1,038.5
Ash found at end of trial, lb. . .	3.75	2.87	7.0
<i>Brake</i>			
Diameter of brake wheel, ft. . .	2.044	2.559	3.142
Fixed load, lb.	94.75	84	136.75
Main spring balance reading, lb.	7.84	6.01	20.7
Net brake load, lb.	86.91	77.99	116.05
Brake, horse-power	5.042	3.997	5.003
<i>Engine</i>			
Revolutions in trial	(not taken)	44,190	25,088
Revolutions per minute	298.1	210.4	144.2
Mean effective pressures from in- dicator, lb. per square inch :—			
Top, H. P.	46.66	43.06	23.80
Bottom, H. P.	45.12	40.26	21.01
Mean, H. P.	45.89	41.66	22.40
Top, L. P.	11.41	—	—
Bottom, L. P.	10.83	—	—
Mean, L. P.	11.12	—	—
Indicated horse-power :—			
Top, H. P.	1.502	2.724	3.344
Bottom, H. P.	1.363	2.451	2.857
Top, L. P.	1.433	—	—
Bottom, L. P.	1.343	—	—
Total	5.641	5.175	6.201

a bad engine, or *vice versa*, and, before any sound opinion can be formed of the general results, the two efficiencies must be considered separately, and their relative importance adjusted.

In determining the efficiency of the boiler, we have only to take account of the coal used and the feed water supplied and evaporated.

Summary of Boiler Results	Simpson, Strickland & Co., Dartmouth	E. R. & F. Turner, Ipswich	Adams & Co., Northampton
Water evaporated per lb. of coal from } feed temperature, lb. }	8-726	7-65	5-978
Equivalent evaporation from and at 212°	10-42	9-063	7-136
Heat wasted per lb. of coal, in evapora- } tion units }	4-70	6-055	7-984
Efficiency of boiler	689	599	528
Thermal units transmitted per minute } through each square foot of heating } surface }	59-42	185-4	150-1
Coal burned per square foot of grate per } hour, lb. }	9-685	16-65	12-75
Water evaporated per square foot of heat- } ing surface per hour, lb. }	8-09	9-71	7-80

These figures tell their story very clearly. In Messrs. Adams & Co.'s engine, little more than half the heat of the coal was given to the steam, in Messrs. Turner's engine $\frac{6}{10}$, while in Messrs. Simpson & Strickland's engine nearly $\frac{7}{10}$ was given to the steam. The figures for coal burned per square foot of grate per hour, and for thermal units transmitted per square foot of heating surface, show the reason of this. Messrs. Adams's boiler was forced, so that it had more than double the duty to do that Messrs. Simpson, Strickland & Co.'s had. Messrs. Turner's boiler was forced even more than Messrs. Adams's, but gives very decidedly better results. If, as is probable from other considerations, there was some priming with Messrs. Turner's boiler, the quantity of priming water carried over should be deducted from the apparent evaporation, and then the figure for their boiler would not be quite so high.¹ But no doubt it was chiefly the better arrangement of the heating surface in Messrs. Turner's boiler, and the reasonable care in clothing it to prevent radiation, to which its superior performance is due. It is perfectly absurd to use unclothed boilers. The clothing costs little, and adds little to the weight. The prevention of radiation means not only a saving of cost in coal, but it means also that a smaller and lighter boiler will do the required work with an equal efficiency. It showed a quite audacious contempt for the most obvious requirements of economical working to enter for competition a portable engine and boiler with all the boiler surface and steam pipes naked.

¹ If allowance is made for priming, Messrs. Turner's boiler result would be worse, but their engine result (consumption of steam per I.H.P. per hour) would be improved. Very possibly there may have been 10 per cent. of priming water in the steam from Messrs. Turner's boiler.

Doubtless some practical objection may be raised to the use of a tubular boiler like that of Messrs. Simpson for rough agricultural purposes. The boiler is no doubt less accessible for cleaning than flue boilers with cross tubes.

Looking, however, to the great disparity of the results, it may be questioned whether the supposed power of using very dirty water in a flue boiler is not purchased too dearly. A farmer might be very well content to take some trouble in getting reasonably good feed water if by so doing he secured (1) a lighter boiler to drag about, (2) a saving both in cost and cartage of nearly half the coal. To adopt a thoroughly bad boiler, merely because it is supposed that dirty water may be used in it with impunity, is very bad engineering and false policy also.

Summary of Engine Results	Simpson, Strickland & Co., Dartmouth	E. R. & F. Turner, Ipswich	Adams & Co., Northampton
Piston speed in feet per minute	298.1	263.0	240.3
Indicated horse-power	5.641	5.175	6.201
Brake-horse-power	5.042	3.997	5.003
Mechanical efficiency	0.894	0.773	0.807
Brake-horse-power per cwt. weight of engine and boiler empty	.3151	.1095	.0926
Cost of engine per brake-horse-power . .	£19 16s.	£21 18s.	£22 18s.
<i>Steam.</i>			
Steam used per indicated horse-power } per hour, lb.	35.75	64.73	57.75
<i>Coal.</i>			
Per indicated horse-power per hour, lb.	4.099	8.461	9.66
Per indicated horse-power per hour, if condensed exhaust steam had been returned to feed tank as usual . . . }	4.072	7.917	—
Real ratio of expansion	4.4	1.2	1.6

These figures show the enormous superiority in economy of the small compound engine to the two others. The compound engine works with half the expenditure of coal required by the single cylinder engines, and, as might be expected, as a consequence develops three times as much power per cwt. of weight of engine and boiler. The compound engine had some advantage in its higher steam pressure, some advantage in its higher piston speed, and some advantage, it is believed, in the drier steam supplied from a boiler with a reasonable amount of super-heating surface. It has also a distinctly better mechanical efficiency, which, however, is partly due to the absence of the feed pump and governor, and, so far as it had an increase of efficiency in this respect, the gain is not fairly to be credited to

it. There is no doubt, however, that the engine friction on this small, light, and quicker running engine was less than in the others.

The Judges were decidedly of opinion that the wettest steam was that supplied to Messrs. Turner's engine. This is distinctly shown by the large cylinder condensation, which will be alluded to presently, and is consistent with the fact that the boiler of this engine was more forced than either of the others. That the steam used per indicated horse-power was slightly greater on the Turner engine than in the Adams engine was no doubt due to this greater initial wetness of the steam. It was necessary, therefore, to consider how far this was due to faulty engineering. The Turner engine was a distinctly smaller engine than the Adams engine, and was worked to a proportionately greater indicated power. If the Turner engine had been worked at a rather less power, the automatic valve gear would have cut off steam earlier in the stroke, the boiler would have been less forced, and almost certainly the steam consumption per H. P. would have been less. Looking to the fact that these small boilers must be somewhat forced, it is worthy of consideration by makers whether some superheating surface, or, at any rate, an efficient separator on the steam pipe, is not essential.

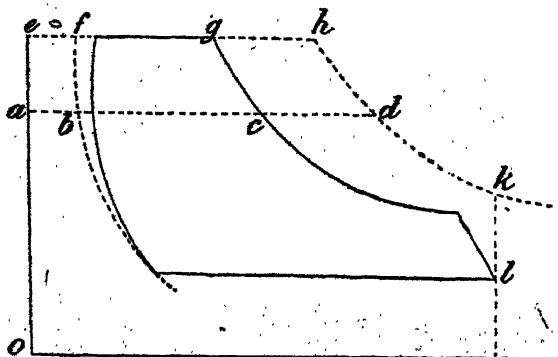
The small superiority in steam consumption is the only advantage the Adams engine gained. In coal consumption it is very inferior to the Turner engine.

Discussion of the Indicator Diagrams.

In order to compare the action of the steam in the three engines tried, an average diagram has been prepared for each in this way. Three or four good diagrams were taken for each engine, and a series of ordinates measured for each, both to the admission and expansion line and to the exhaust line. From the mean of the measured ordinates a new diagram was constructed, which represents more nearly than any single diagram the average action of the steam during a stroke. The clearance space is then set off, and a compression line for saturated steam has been drawn for one point, selected on the compression curve of the diagram. This curve should agree nearly with the actual curve, and does so except for the Adams engine. In that case either, as is probable, the clearance has been assumed too small, or there was leakage during compression. Then any abscissa, such as $a b$, $e f$ (fig. 2), represent the cushion steam reckoned as saturated steam at the pressures $o a$, $o e$. From f set off $f h$, to represent the weight of steam admitted

per stroke, reckoned as steam at the pressure oe , and draw another saturation curve hk . Then any abscissa, such as ad , represents the steam which ought to be found in the cylinder at the period of expansion when the pressure was oa . But the diagram shows that there was only present as steam at that time the volume ac . Hence cd represents steam condensed by the action of the cylinder sides. With a slight reservation, which need not be insisted on here, the horizontal intercept

Fig. 2.



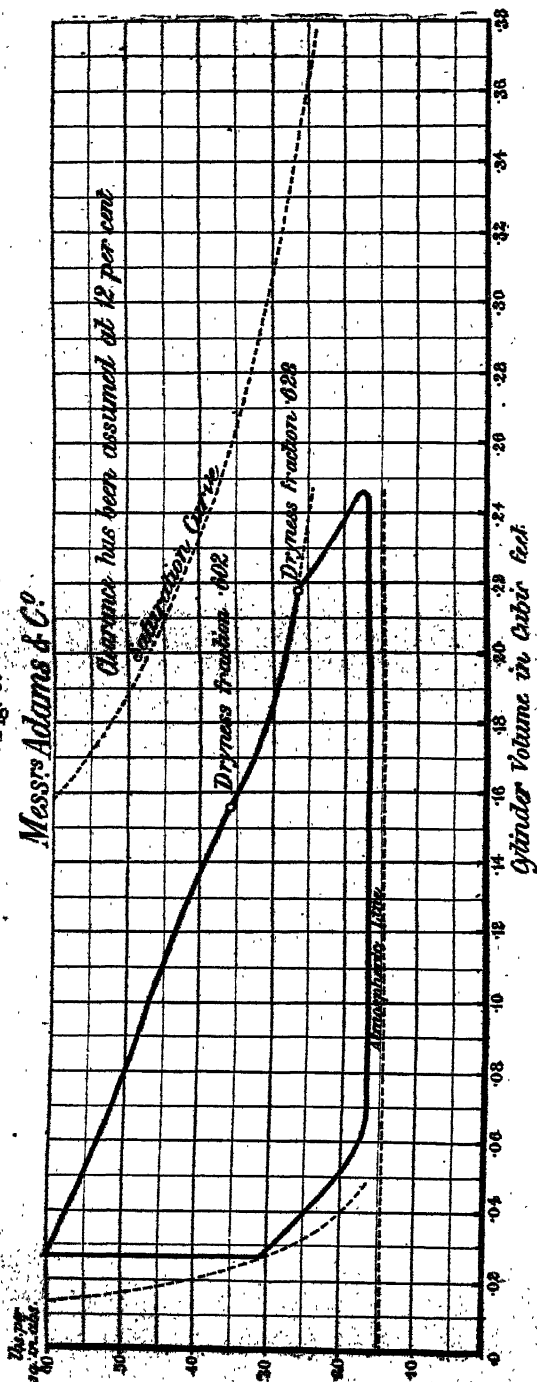
between gl and hk represents, for each point of the expansion, the amount of condensed steam in the cylinder. The approach of gl to hk would mean that there was re-evaporation due to heat abstracted from the cylinder wall. The ratio $ac \div ad$ is what is termed the dryness fraction of the steam, and this has been calculated, and marked on the diagrams, at cut off and release.

Taking Messrs. Adams's diagram first (fig. 3), it is seen that the dryness fraction at cut off is 0.602, so that four-tenths of the steam in the cylinder has been condensed at cut off. At release the steam is a very little drier. The steam is wiredrawn during admission, the cylinder being somewhat too large for the work to be done. As this engine is regulated by a governor acting on a throttle valve, there would have been on the average the same wiredrawing if the governor had been in action, but the diagrams would have varied more. The diagram is a fairly good diagram for an engine working at the pressure and speed selected by the exhibitor. The real ratio of expansion in this engine was 1.6.

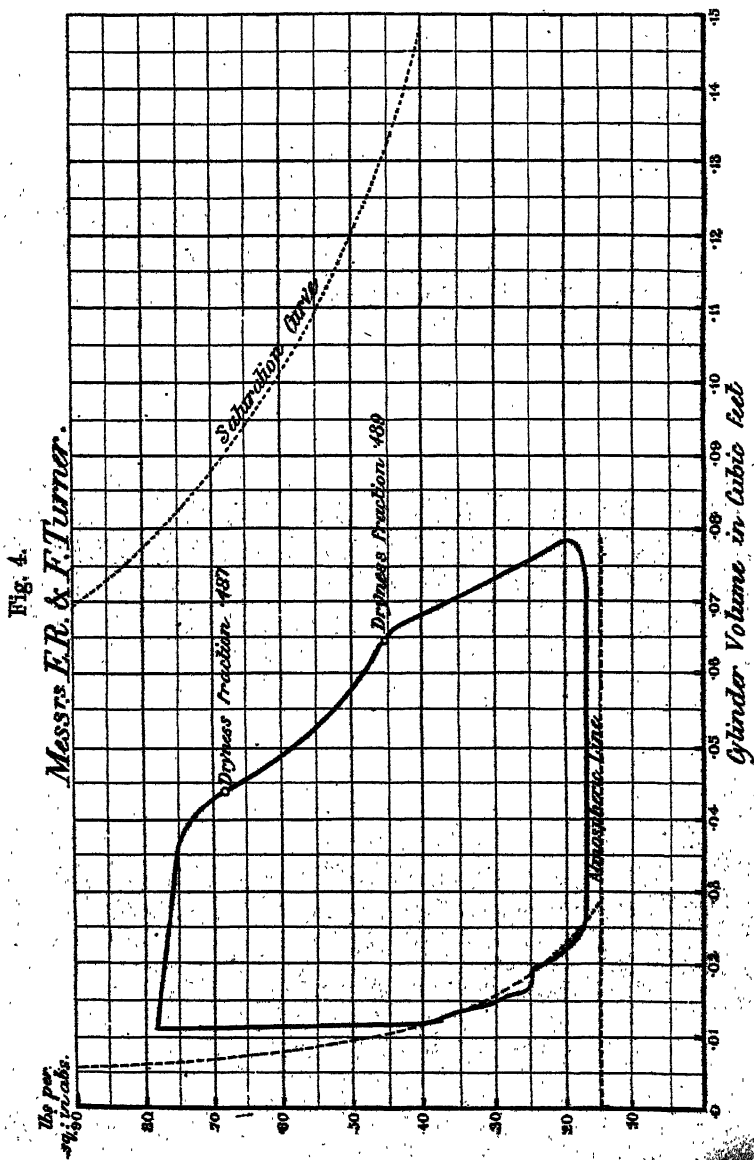
The diagram of the engine of Messrs. E. R. & F. Turner (fig. 4) shows very strikingly the defects inherent in small, slow-running single cylinder engines. The condensation in the cylinder is enormous. The dryness fraction at cut off is 0.487, so that more

Fig. 5.

Messrs Adams & Co.



than half the steam in the cylinder is condensed. The real ratio of expansion is only 1.2, so that the cooling action on the cylinder wall occurs practically entirely during exhaust. The curious

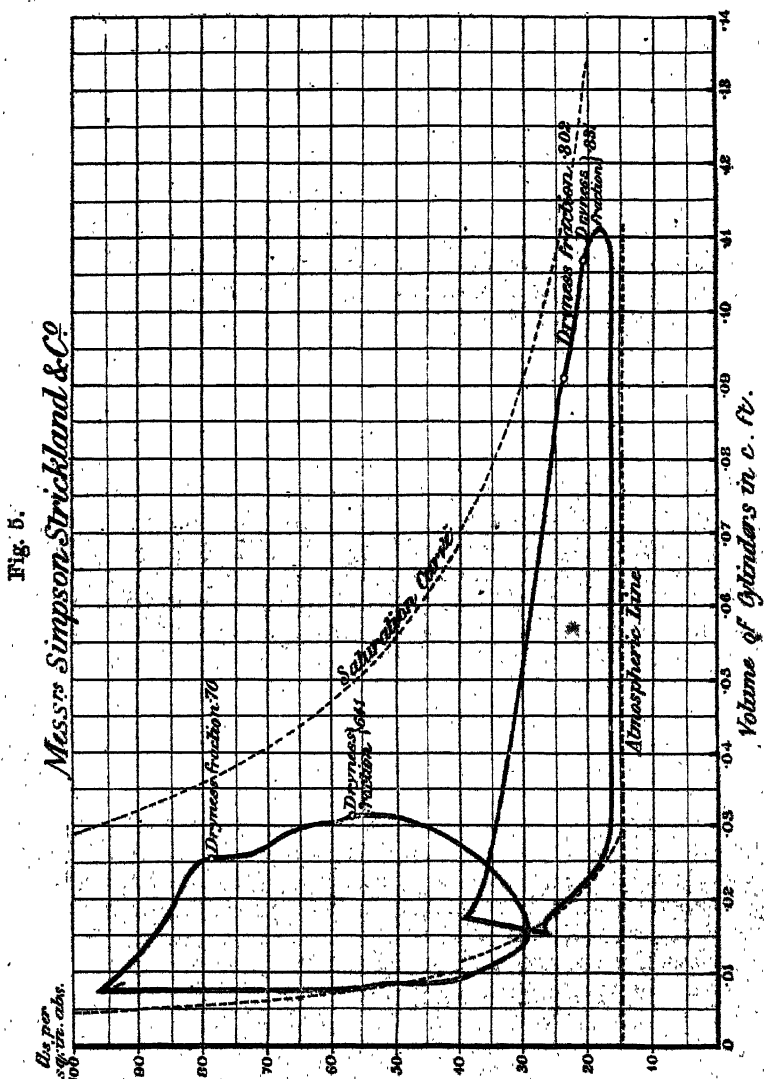


irregularity of the compression line of the diagram appears to be due to the expansion of the steam into the passage way of the Trick valve. The regulation of the admission in this engine, by a governor acting on the slide valve, was a much better arrangement than that shown on any other engine. It would have the effect with a lighter load of cutting off the steam sooner. In the opinion of the Judges, therefore, this engine would have shown a gain of economy with a rather less load. The very large cylinder condensation shown is hardly explainable, if the engine was not supplied with wet steam. With a rather lighter load, the boiler would have been less forced, and probably in that case there would have been a distinct reduction of the cylinder condensation.

The diagrams for the compound engine of Messrs. Simpson, Strickland & Co. (fig. 5) are decidedly better than those for the simple engines. The dryness fraction during the expansion in the high pressure cylinder varied from 0.70 to 0.64, so that there was less waste of steam than in either of the single cylinder engines. Nor is this all. During the low pressure expansion the dryness fraction was 0.802 to 0.831, showing that a considerable fraction (about one-tenth) of the water in the high pressure cylinder was evaporated in the engine, and acted as steam doing work in the low pressure cylinder. The real ratio of expansion in this engine was 4.4, and it is to this greater expansion, together with the less waste of steam by condensation, that the very remarkable gain of economy in this engine compared with the others is due. There is obviously a good deal of waste expansion in this engine, the actual diagrams filling up very badly the space between the two saturation curves. That is a defect due in part to the very simple and rather crude mode of compounding adopted. It should be remembered, however, that waste expansion, like wiredrawing, is not entirely a loss. Both these actions tend to dry the steam, and so to reduce the prejudicial action of the cylinder sides.

Looking at the diagrams of the single cylinder engines, one is driven to ask whether an engine in which half the steam is condensed before it has done any work, and the whole of the heat expended in producing it thrown away during exhaust, can represent good engineering practice. When one finds that these engines were using $57\frac{1}{2}$ and $64\frac{1}{2}$ lb. of steam to the indicated horse-power per hour, and that they required 8.46 and 9.66 lb. of the best Welsh coal to the indicated horse-power per hour, one is no doubt tempted to think that they represent very bad engineering practice, and that the makers must have been culpably negligent or grossly ignorant in designing the

engines. That the large consumption of coal and steam implies faulty engineering is true in a sense and false in a sense, and it may be useful to distinguish exactly what those two senses are.



The engines tried were small and comparatively unimportant, intended to be used for rough purposes with unskilled attendants. Hence two of the makers have adopted a moderate

steam pressure, a low speed of piston, and for simplicity a single cylinder, as governing conditions. Given those governing conditions, there is no reason for supposing that the engines tried were bad engines,¹ or that any others in the market which could have been put into the competition would have achieved sensibly better results. For the conditions assumed are exactly those which involve as a practically unavoidable consequence an enormous cylinder condensation, and a condensation which increases so fast with any increase of expansion that full steam must be carried through a great part of the stroke. Some amelioration might be obtained, if a moderate super-heating can be given in the boiler, but this is almost the only way in which any sensible improvement is to be gained.

But are the conditions of moderate pressure, low speed, and the extreme of simplicity rightly selected? It appears that makers have overlooked the fact that these conditions not only involve inefficiency in the engine and consequent cost in coal, and increased cartage of feed water, but they also involve as a consequence that the engine and boiler are large, heavy, and costly. The results for the engine of Messrs. Simpson, Strickland & Co. show that we may have, with very little additional complication, three times as much power per cwt. of weight of engine and boiler, and at the same time use less than half the coal, and little more than half the feed water.

Hence the moral of the trials is that small single cylinder steam engines, such as those tried, are only defensible on the assumption that a quicker piston speed, a somewhat higher steam pressure, and a second cylinder, are altogether unsuited to engines for agricultural purposes. If economy of coal were alone in question, perhaps this view might be plausibly defended, but it can hardly be adhered to when the greater portability of the other type of engine is also taken into account.

It may be admitted that the engine and boiler of Messrs. Simpson, Strickland & Co. was not an entirely satisfactory specimen of its class. But the results show that it belongs to an altogether better class than the engines competing with it. And it shows exactly the direction in which improvement can be made, if makers can be persuaded to abandon a type of engine which has been adopted largely in ignorance of its inherent and incurable defects.

PETROLEUM ENGINES.

Two petroleum engines were entered for competition, in both of which the petroleum or shale oil was vaporised, mixed with

¹ The reasoning here applies to the engines only, not the boilers. Messrs. Adams's boiler was not a good one.

air, and then exploded in a cylinder. The action of these engines is therefore very similar to that of a gas engine, with the difference, however, that the fuel used is much more portable. It may be said at once that the working of the Priestman engine was altogether satisfactory, and it worked with an economy of fuel almost unprecedented. So far as could be judged from a trial extending altogether over nearly six hours, the action of the engine was faultless, and, in spite of the high price of the fuel used, it is probable that it may in many cases supersede steam engines for small powers and for intermittent work.

The other engine, exhibited by Messrs. Brown & May, is clearly at present in a much less satisfactory condition. Possibly it was in part an unfortunate accident that at the formal trial there was great difficulty in starting it. It was certainly in any case much less economical of fuel than the Priestman engine. Without wishing in any way to conclude that this engine cannot be made a satisfactory and useful one, but judging it merely as it behaved on the trial run, it did not appear desirable or just to pass so favourable a verdict on its performance, as would be implied by the award of a prize.

Messrs. Priestman's engine (First Prize 30*l.*).—This was a nominal $4\frac{1}{2}$ horse-power engine, weighing empty $47\frac{1}{2}$ cwt., or about the same as a single cylinder portable steam engine of the same power. The engine is described by the makers as a portable oil engine (Priestman & Hume's patent), with oil cistern, vaporiser, air pump, and electric igniting apparatus, mounted on wheels and axles, with shafts.

The cylinder is 8.499 inches diameter, the stroke 12 inches, and the normal speed 180 revolutions per minute. The clearance space is given as 403.6 inches.

The fuel used on the trial was a mineral oil selected for use in the Northern Lighthouses, and sold as Broxbourne oil. It is stated to cost $6\frac{1}{2}$ d. per gallon.

The density of the oil, determined by Mr. C. J. Wilson, was 0.8101, so that it costs 0.802*d.* per lb.

The action of the engine is this. The oil reservoir is supplied with a small amount of compressed air by the air pump. Under the action of the air pressure the oil is driven through a carefully regulated nozzle into a vaporising chamber, kept hot by the exhaust from the engine. The liquid oil is split up into spray as it enters the vaporising chamber, and apparently evaporates instantly. In the forward movement of the piston, a supply of vapour and air is drawn into the cylinder from the vaporising chamber. The return of the piston compresses the

charge into the clearance space of the engine. It is then exploded by an induction spark, expands driving the piston, and on the return stroke is expelled. The cycle is similar to that of the Otto engine. A water jacket is used, as in gas engines, to keep the cylinder cool; but it would rather seem from the observations that not only is the initial explosion rather less violent than in a gas engine, but the temperature of the cylinder is lower.

The governing arrangement is extremely ingenious. A small high speed governor is connected to a taper spindle, through which the oil passes to the spray-maker. The rotation of this spindle regulates the amount of oil used. At the same time a throttle valve, actuated by the same governor, regulates the amount of air admitted to the vaporising chamber. In starting, a small hand pump is used to initially compress the air in the oil reservoir, and for a short time the vaporising chamber is heated by a lamp. In the first trial of the engine, the heating of the vaporising chamber began at ten hours and fourteen minutes. At ten hours twenty-seven minutes the engine started without difficulty. Indicator diagrams were taken every fifteen minutes. The temperature of the water flowing into and out of the jacket, and the spring balance load, were noted every ten minutes. The amount of oil used was determined by weighing in enough oil into the oil reservoir to fill it to the same level as at starting. The water flowing from the jacket was weighed. No oil is used in lubricating the cylinder which could add to the fuel burned. The explosions were noticed from time to time, but they were perfectly regular, and the exhaust was quiet and apparently contained no unburnt oil. No missed explosion was noticed, so that the number of explosions is taken at half the number of revolutions.

As in many explosive engines the efficiency falls off greatly when the load is reduced, it was thought desirable to make a trial with half the normal load. There is an unavoidable loss of efficiency with a decreased load, because the engine friction, which in these small engines is considerable, is nearly constant and independent of the load. Making allowance for this, the performance of Messrs. Priestman's engine in the half-power trial may be taken to have been satisfactory. It will be seen that the engine friction was 0.75 horse-power, or 14 per cent. of the indicated power in the full-power trial, and 0.85 horse-power, or 26 per cent. of the indicated power, in the half-power trial.

Messrs. Brown & May's engine was a nominal 1 horse-power engine, with a cylinder 4.252 inches diameter and 9 inches stroke. It weighs empty 18½ cwt., and costs 100l. The oil used was

Russian lustre oil, costing, it was stated 6d., per gallon. Normally, there is one explosion to every three revolutions. The charge is fired by a platinum coil kept incandescent by the flame of a lamp, the moment of ignition being determined by the movement of a slide valve. The engine is regulated by a hit-or-miss governor, which suppresses the admission of vapour if the speed rises. The lamp for heating the vaporising chamber was

Trials of Petroleum Oil Engines	Priestman		Brown & May
	Full-power trial	Half-power trial	
<i>Brake.</i>			
Radius, ft.	3.504	3.504	3.16
Fixed load, lb.	79	39.25	11.5
Mean spring balance reading, lb.	3.91	0.07	0.77
Effective load on brake, lb.	75.09	39.18	10.73
Duration of trial, mins.	150	120	90
Total revolutions in trial	26,982	21,700	30,615
Mean speed, revolutions per min.	179.5	180.8	340.2
Brake-horse-power.	4.496	2.362	1.097
<i>Indicator.</i>			
Mean effective pressure, lb. per square inch	33.96	20.65	54.1
Explosions per min. taken at	89.75	90.4	83
Indicated horse-power	5.243	3.210	1.450
Mechanical efficiency.	0.857	0.7385	0.757
<i>Oil Fuel.</i>			
Total oil used, lb.	13.97	9.375	5.03
Oil used per hour	5.588	4.687	3.35
Oil used per hour per indicated horse-power, lb.	1.066	1.460	2.31
Oil used per hour per brake-horse-power, lb.	1.243	1.984	3.054
<i>Jacket Water.</i>			
Total amount used, lb.	3,251.6	—	—
Jacket water per hour, lb.	1,301	—	—
Mean initial temperature, Fahr.	60.14°	—	61.3°
Mean final temperature, Fahr.	103.69°	—	93.98°
Rise of temperature, Fahr.	43.55°	50.58°	32.68°

lighted at three hours thirty-two minutes. But the engine did not really get started till four hours twenty minutes, the engine being kept going in the interval by hand regulation. The exhaust was very violent, partly from the high pressure at the end of the stroke, and partly also it appeared from the imperfect combustion during the stroke. The explosions were also very irregular. The following observations were made on this point:—

	Explosions per minute
4 hours 28 minutes	86
4 " 33 "	76
4 " 40 "	92
4 " 50 "	91
5 " 10 "	82
5 " 40 "	72
Mean	83

The following is the oil account for this trial, which lasted 90 minutes:—

Oil used in cylinder	lb. 4.75
Oil used for igniting lamps	.28
Total	5.03

At the end of the trial fourteen ounces of oil were found to have accumulated in the vaporiser. If all this accumulated during the period of the trial, it should be deducted from the amount given above. It is more probable, however, that it accumulated in the vaporiser during the long and unsatisfactory attempt to start the engine.

Analysis of the oil used.—An analysis of the petroleum oil used in the Priestman Engine trial has been made by Mr. Charles J. Wilson. He reports thus:—

The sample of oil received from Prof. Unwin, June 24, 1890, and marked "Priestman Engine," gave the following results on examination:—

Specific gravity at 15° 5 C. = 0.8101.

Composition by weight:—

Carbon	86.01 per cent.
Hydrogen	13.90 "
Undetermined	0.00 "
	100.00

Fractional distillation:—

From 160° to 205° C.	18 volumes per cent.
" 205° to 210°	10 " "
" 210° to 220°	18 " "
" 220° to 240°	28 " "
" 240° to 270°	25 " "

Heating value. The composition by weight multiplied by the usual factors gives,

0.8601 × 8,080	= 6949.6
0.1390 × 29,000	= 4031.0
	10980.6

Hence evaporation per lb. of oil = $\frac{10980.6}{537} = 20.4$ lb.

This figure is not an accurate one, but I am not acquainted with any method by which the heating value of such a material can be precisely determined.

CHARLES J. WILSON.

The heat value, as determined from the chemical composition, is therefore 20.4 evaporation units, or 19,700 thermal units per lb. The uncertainty as to the heat value to which Mr. Wilson alludes is due to the fact that the heat of formation of the hydrocarbons in the oil is not known. It is almost certain that the heat value deduced from the carbon and hydrogen should be reduced a little to allow for this. Consequently the heat value will be taken in the following calculations at 19,000 thermal units.

Economy of cost of fuel in petroleum engines.—The Brown & May engine may be set aside as not having been in perfect working order during the trial. It remains then to compare the results of the Priestman full-power trial with results obtained in motors of other types. For the purpose of such a comparison it may be assumed that the very best large condensing steam engines use $1\frac{1}{2}$ lb. of Welsh coal per indicated horse-power per hour. Taking Messrs. E. R. & F. Turner's engine, to which the Second Prize in the class of steam engines was awarded, as representing a fairly good example of small non-condensing steam engines of about the same power as the petroleum engine, the consumption is 8.461 lb. of Welsh coal per indicated horse-power per hour. Gas engines working with Dowson gas producers are known to work with about 1.3 lb. of coal per indicated horse-power per hour. It is obvious that the Priestman engine works with about as much fuel as the very best large steam engine, with about one-eighth as much fuel as a small non-condensing engine, and with an economy about as great as that of a gas engine with Dowson gas producer. The comparison can, however, be made more accurately if we assume, on the best data available, values for the cost and calorific value of the fuel.

Data assumed. Welsh steam coal, 24s. a ton or 0.1286d. per lb. Heat value, 14,600 Th. U. per lb.

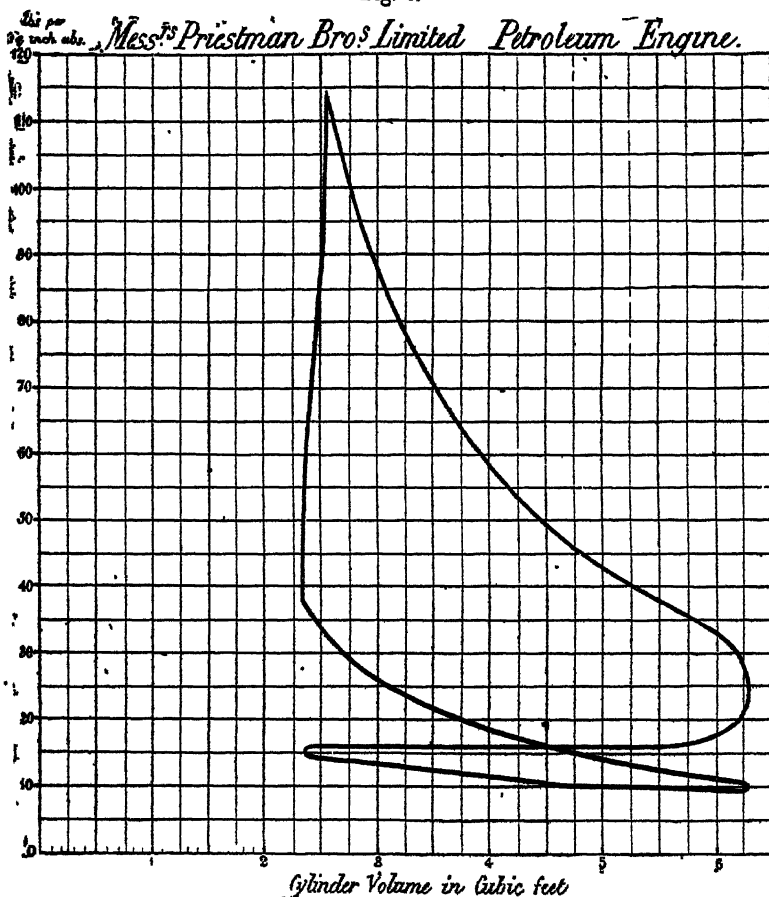
Coal gas.—In Professor Kennedy's trial of the Otto gas engine 20.76 cubic feet were used per indicated horse-power. The heat value of the gas was 626 Th. U. per cubic foot, and the cost of the gas may be taken at 3s. per 1,000 cubic feet.

Petroleum.—The oil used in the Priestman engine cost 0.802d. per lb., and its heat value will be taken at 19,000 Th. U. per lb.

With these data we get the table on the following page.

There is no doubt that the figures in this table show the performance of the Priestman oil engine to have been a remarkably good one. Taking actual weight of fuel used per indi-

Fig. 6.



HEAT USED PER HOUR.

	Th. U.	Per cent.
Total heat of combustion of 5.588 lb. of oil	106,150	100.0
Heat corresponding to useful work at brake.	11,580	10.86
Heat wasted in engine friction	1,920	1.81
Total heat shown by indicator	13,450	12.67
Heat given to jacket water	56,600	53.39
Exhaust waste and other losses	36,040	33.96

W. C. UNWIN.

222

THE TRIALS OF GRIST MILLS AND DISINTEGRATORS AT PLYMOUTH.

THE second and third classes of machines entered for trial at Plymouth were respectively allotted to Grist Mills and Disintegrators, the trials taking place in the Show-yard.

CLASS 2.—*Grist Mills for use on a Farm.*

Judges.

JAMES EDWARDS, Belmont, Flax Bourton, Bristol.

DAN. PIDGEON, C.E., Walsingham House, Piccadilly.

THOS. STIRTON, West Stratton, Micheldever, Hants.

Prizes: FIRST, 20*l.*, SECOND, 10*l.*, for the best Grist Mills for use on a farm to be worked by an engine not exceeding 10 brake horse-power.

Conditions of Trial.

The various entries in this class will be driven separately by the same engine, provided by the Society.

The amount of steam used for the execution of a given amount of work will be the gauge of efficiency.

The following will be the points awarded:—

1. Cost	20
2. Simplicity combined with strength, workmanship, and durability	15
3. Power taken to drive same	15
4. Uniformity of working and facilities for regulating	10
5. Uniformity of produce	15
6. Attendance necessary	15
7. General adaptability for grinding various kinds of produce	10
	100

Twenty-six mills were entered for trial in Class 2, but the number actually tested was reduced to sixteen, either by voluntary withdrawals during the contest, or under the operation of Clause 34 of the "Regulations for the Exhibition and Trial of Implements," directed against the needless multiplication of experiments with machines by the same maker, duplicates in construction, although differing in size and price.

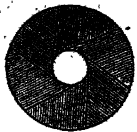
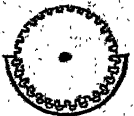
The list on the opposite page (Table I.) enumerates all the mills which took part in the competition, arranged in order of trial.

Six different principles, shown in diagram by Table II., were exemplified in the sixteen mills tabulated above, principles which, as will presently appear, are all "as old as the hills," a fact which, while it takes nothing from the value of the competition, may, it is hoped, furnish such interest as "ancient history" can yield to a necessarily prosaic report.

TABLE I.

Order of trial	Date of trial	Name and address of maker	Catalogue No.	Price
				£ s. d.
1	June 21	Woods & Co., Stowmarket	3286	17 10 0
2	"	E. R. & F. Turner, Ipswich	3497	35 0 0
3	"	Blackstone & Co., Lim., Stamford . .	2565	13 10 0
4	"	R. A. Lister & Co., Dursley	2400	18 10 0
5	"	Henry Bamford & Sons, Uttoxeter . .	3366	22 10 0
6	"	Henry Bamford & Sons, Uttoxeter . .	3364	22 10 0
7	"	Henry Bamford & Sons, Uttoxeter . .	3363	24 10 0
8	June 23	Barford & Perkins, Peterborough . .	2420	16 0 0
9	"	{ Charles Burrell & Sons, Lim., Thetford }	3321	17 0 0
10	"	{ Samuel Corbett & Son, Wellington, Salop }	3460	13 0 0
11	"	W. N. Nicholson & Sons, Lim., Newark . .	3329	18 0 0
12	"	John Williams & Son, Rhuddlan	2543	15 0 0
13	"	Woodroffe & Co., Rugeley	3441	21 0 0
14	"	Woodroffe & Co., Rugeley	3442	18 10 0
15	"	{ Agricultural Mill Co., Laurence Pountney Hill, London }	3428	18 18 0
16	"	Robert Graham, Carlisle	3484	27 10 0

TABLE II.

	System		Represented by
1. The millstone	Fig. 1.		Blackstone, Lister, Graham.
2. Metal discs	Fig. 2.		Corbett, Woods, Burrell, Williams.
3. Conoidal metal discs }	Fig. 3.		Nicholson, Bamford.
4. Grooved roller and breast }	Fig. 4.		Woodroffe.
5. Grooved roller and breast, with end-wise delivery . . }	Fig. 5.		Barford & Perkins, Agricultural Mill Co.
6. Rollers	Fig. 6.		Turner, for all classes of grinding. Bamford, Woods, and Woodroffe, for cast.

The Millstone (Fig. 1) is older than human history, being familiar to us in the quern, the Etruscan sheller, the Pompeian and Egyptian mills; but it will appear, later, that stones are not so well adapted to the purposes of grist milling as metal plates or rollers.

Metal Discs (Fig. 2) were used by Napoleon on the march to Moscow for the purpose of supplying his troops with meal. The "French Military Mill," as it was called, consisted of a pair of cast-iron discs about 12 inches in diameter, vertically arranged, and turned by hand—a machine similar, indeed, in all essential respects, to that which took the first prize at Plymouth. Francis Devereux patented this "Military Mill" in England in 1824, and the recent winner may perhaps reflect, with some satisfaction, that "Peace with Honour" attends the latest triumph of a machine having forefathers born in a camp, and nurtured amid the clash of arms.

Conoidal Metal Discs (Fig. 3) were invented by David Selden, of Liverpool, who, in 1831, took out a patent for a mill which worthily fathers that of Bamford and Nicholson. Indeed, it is a question whether it might not have gone hard with the descendants in question, at the Plymouth trials, could their ancestor have appeared there as a competitor.

Grooved Roller and Breast (Fig. 4).—In 1833, a certain Thomas Don, of Westminster, patented a vertical millstone which, revolving peripherally, bore against the segmental curve of a second stone of rather larger radius than the runner; but Don was, himself, anticipated by Charles Williams, of Southwark, who, in 1810, made a metal mill consisting of a grooved roller working against a breast formed of a number of knives, screwed together so as to form the same curve as the roller, the knives being removable for the purpose of sharpening. The roller in Williams's machine was kept up to the breast by weighted levers, which, while furnishing pressure enough for the purpose of grinding, allowed the breast to give way, exactly as in modern practice, on the passage through the mill of hard foreign substances.

Conical Roller and Breast, giving endwise delivery of Meal (Fig. 5).—Amory Felton, an American, seems to have been the first inventor, in 1855, of the horizontal conical roller and breast, which, first introduced into this country by Riches and Watts in 1857, became a model for the well known and now widely distributed Barford & Perkins's gristing mill.

Roller Mills (Fig. 6), like the millstone, are older than human history. Niebuhr, in 1772, described a roller mill, of refined construction, but of unknown antiquity as to design,

in common use among the Arabs; and Livingstone speaks in praise of the flour produced by a rude roller mill, also of unknown antiquity, in use among certain African tribes. One Isaac Wilkinson patented in England, in 1752, a plan of crushing grain by smooth metal rollers, and, so far as oats are concerned, the method is very extensively used to-day, although rollers—like millstones, as will presently more clearly appear—are inferior to disc- and breast-grinding for the purpose of grist milling.

The Plymouth trials may be regarded as an attempt to select from among modern improvements upon the six venerable systems of grinding above described that which is best fitted for a farmer's use; and it is matter for congratulation that, having regard strictly to this problem, the experiments gave no uncertain sound in declaring that flat metal discs have the greatest general adaptability for grist milling, while they are economical of power and time, produce good feeding samples, and are cheaper both in first cost and renewals than any other mills.

But if no "uncertain sound" proclaimed the first prize machine, it is only fair to state the actual relationship of merit in which the first three mills, say, stood to each other after trial. The plan of judging by "points of merit," when strictly followed, enables such a statement to be accurately made, and it seems more just to indicate the relationship in question rather than to leave it to guess-work. At the risk, therefore, of making a somewhat wide departure from past practice, but in the interest of a more intelligent use of the prize system, it may be said that the mill which took the second prize proved to be 8 per cent. less meritorious than the first prize machine; while the Barford & Perkins mill, which stood third in order of merit, was $11\frac{1}{2}$ per cent. inferior to the winner.

The trials took place on June 21 and 23, in a large and convenient shed, whose one open side gave upon a railroad, extending the whole length of the shed itself, and serving to carry a timber stage, upon which were mounted the steam-engine furnishing motive power, together with an attached registering dynamometer, through which such motive power was delivered to the mills. The stage itself could be quickly moved, by means of a windlass and rope, from mill to mill, and since each exhibitor had been informed beforehand of the speed of the driving strap, he was already provided with a pulley of the proper diameter to give him such a number of revolutions per minute as he required. This arrangement worked very well. The shift from mill to mill was made in a few minutes and

when, as in Bamford's case, the exhibitor's attendant was a remarkably quick and intelligent man, in a few moments.

Each competitor received about $\frac{1}{2}$ cwt. of maize wherewith to make his adjustments, but no notes were taken by the Judges of these "preliminary" essays. During the trials proper, $\frac{1}{2}$ cwt. each of maize, beans, and oats were served successively to each mill, and, where the machine promised well, a final $\frac{1}{2}$ cwt. of barley was added. The time occupied in grinding each dose of grain was taken by chronograph, while the power absorbed during that time was registered by the recording dynamometer. Samples of the meal produced were collected in numbered boxes, from time to time, as the work went on, and these samples were judged "blindfold," or without knowing which was which, on the morning after all the trials had been concluded.

Eight mills were soon found to be, more or less, "in it"; and it is proposed to confine this report to notices of their performances, since nothing would be gained by chronicling demerit, while the reader of Show statistics deserves every possible consideration at the hands of a reporting Judge. The mills in question comprise those of Corbett (3460), Woodroffe (3441), Barford (2420), Bamford (3366, 3364, 3363), Blackstone (2565), and Lister (2400). It will, probably, assist the reader to general conclusions if, disregarding the order of trial, these mills are described in the order of classification already established, viz.:—

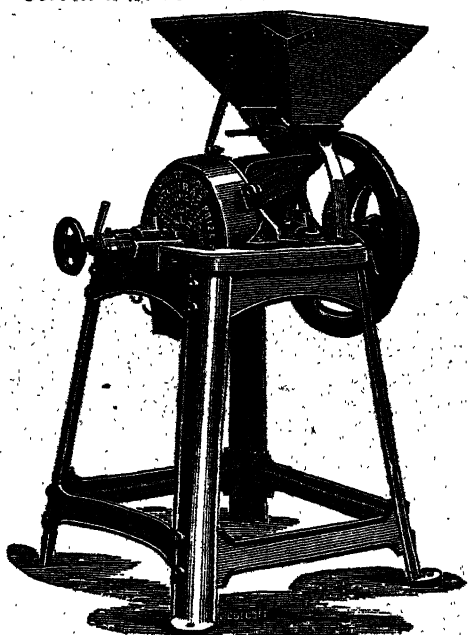
No.	Type	Represented by
1	Millstones	Blackstone; Lister
2	Flat metal discs	Corbett
3	Conoidal metal discs	Bamford
4	Metal roller and breast	Woodroffe
5	{ Conical metal roller and breast with endwise delivery of meal.	Barford

Type I. Millstones.—It has already been stated that millstones are inferior to metal mills for the purpose of gristing, and, while it is quite true that both Blackstone and Lister produced excellent samples of meal, this was done at an undue expenditure both of time and power. Between the two stools of miller and farmer both these machines fell to the ground, the work being too good for the farmer and not good enough for the miller; while "general adaptability for grinding various kinds of produce," worth 10 points out of 100 in this competition, was certainly not characteristic of the stone mills. In addition, millstones themselves are more costly than castings, besides requiring constant and skilled care in dressing. Hence, nothing

further will be said either of Blackstone or Lister in this report, saving that both these exhibitors showed a well-designed and well-made mill, moderate in price, and capable of producing an excellent sample of meal, but "out of it," so far as gristing is concerned, by large comparative losses of "points of merit" in respect of time, power, and adaptability.

Type II. Flat discs.—Samuel Corbett & Son's grist mill (3460), which took the first prize, consists of a pair of grinding discs $17\frac{1}{2}$ in. diameter, made of chilled cast-iron, trued on their faces by grinding. The discs have a "dress," illustrated by Fig. 2 (Table 2), the tangential grooves being $\frac{7}{16}$ in. pitch and $\frac{1}{8}$ in. deep at the centre, and $\frac{5}{16}$ in. pitch and $\frac{1}{8}$ in. deep at the periphery of the disc. The discs

Corbett & Son's First Prize Grist Mill.



are vertically disposed, and are contained between the bearings of the mill spindle, an arrangement which gives great steadiness in work. The live disc, or "runner," is carried upon a horizontal shaft, driven direct by belting at 440 revolutions per minute, and is kept apart from the dead disc by means of a spiral spring encircling the driving shaft, and pressing against the pulley bearing. A set screw, acting against the pressure of this spring, adjusts the discs for fine or coarse grinding, while an independent pair of strong spiral springs, taking the place of Williams's eighteenth-century levers, provide for the passage of hard foreign substances through the mill without injury to the grinding surfaces. The feed consists of a joggling shoot, provided with a perforated screen for the separation of straws, sticks, &c.; while the admission of corn is regulated by a hopper slide. The joggling apparatus in this mill is peculiarly simple and very quiet in

its operation. The mill is supported by a substantial iron frame, and occupies a floor-space of 3 feet 9 inches $\times$ 3 feet 6 inches, while the hopper is not too high for the easy discharge of grain. The weight of the machine is under 6 cwt., and its price, 13*l.*, very moderate.

Upon going to work, on June 23, the Corbett mill disposed rapidly of its 2 cwt. of assorted corn, producing good samples of meal designed for feeding purposes, working very steadily and noiselessly, requiring little attention, and at once creating that "favourable impression" which, subject to confirmation by "weighing and measuring," suggests a prize-taker very early in a run. The records of the time occupied and power absorbed by this, as well as the other mills, will be found collected in Table III. (page 613), for the sake of easy comparison.

Type III. Conoidal discs.—Messrs. Henry Bamford & Sons exhibited three different types of mills, all of which received a more or less complete trial. Mill No. 3366 consists of a pair of vertically arranged cast-iron discs, 14½ inches diameter, of conoidal profile, with a reversible peripheral ring. The discs are of hard white iron, trued up by grinding, and are driven at 450 revolutions per minute by strap direct. The arrangements for setting to grind coarse or fine, as well as for safeguarding the discs from the passage of hard foreign substances through the mill, are similar to those already described. The grist, after leaving the mill, is received on a jogging screen, which separates the coarse from the fine meal, depositing the former in a box, from which it is occasionally returned to the hopper by the attendant. The mill can be supplied without this screen at a proportionately lower price. This machine made good samples, whether in maize, beans, oats, or barley, and the work was expeditiously done. Reference is again made to Table III. for comparative particulars of draught and duty.

Mill No. 3364 is similar to that just described, but furnished with a pair of rollers 8 inches diameter and 9 inches long, for crushing oats. One of these rollers is sparsely grooved, the other is smooth. They are geared together at equal speeds, but are not permitted to come into contact with each other. Adjustment is effected by a pair of set screws which force the bearings against stops, while the stops themselves are, very simply, adjustable so as to allow for wear in the rolls. The plan is good, and takes less power than contact crushing. This mill received ½ cwt. of oats only, it being considered needless to re-experiment with the grinding discs, and made an excellent sample, the work being done expeditiously.

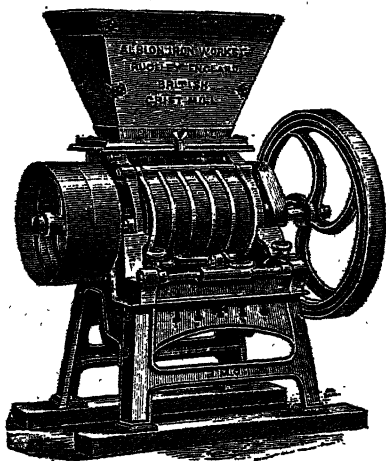
Mill No. 3368 is similar in principle to No. 3366, but is

furnished with two pairs of grinding discs, set one above the other, so that the grist from the upper falls into the lower mill and is there re-ground, necessarily producing a very fine sample. This machine received $\frac{1}{2}$ cwt. of maize only, and made excellent work, but the whole arrangement was so obviously designed to "butter bacon," and as obviously involved the purchase by the farmer of two mills instead of one, that the Judges thought it needless to do more than ascertain how finely this mill could grind. All Bamfords' mills were well designed and well made, but they lost points, in comparison with the prize machines, both in time and power.

Type IV. Roller and breast-grinding.—Messrs. Woodroffe's mill (No. 2543) consists of a grooved roller 12 inches in diameter and 16 inches long, of chilled cast-iron, trued up

Woodroffe's Second Prize Grist Mill.

by grinding in contact with an emery wheel. The roller turns, at the rate of 300 revolutions per minute, against a concave, also of chilled iron, which encircles about one-third the circumference of the grinding roller. The flutes of the latter are parallel with its axis and $\frac{3}{8}$ -inch pitch, while the concave is fluted *en zigzag*. The concave is strongly and truly hinged to the mill-frame, and is kept up to its work by a pair of weighted levers, which give way to allow of the passage of hard foreign bodies through the mill. Adjustments for coarse or fine grinding are made by set screws, which control the movement of the concave around its hinges, while a provision is made for instantaneously detaching the concave itself from the adjusting gear, so that the mill can be "opened" in a moment if needful.



A good deal of interest attaches to mills of this type. As already indicated, the principle of breast-grinding was introduced by Williams in the early part of this century, while later, or in 1857, John Hardley, of Shide, Isle of Wight, patented a mill consisting essentially of "a drum or cylinder, having a furrowed or indented periphery revolving within a concave, the inner surface of which is also furrowed or grooved, the former

flutings being by preference parallel to the axis of the roller, while the latter are inclined thereto."

Hardley's mill very soon came to be considered the best general grinder and crusher, since it dealt effectively and expeditiously with a variety of substances, absorbed little power, was constructively very simple and strong, while the facilities it offered for adjustment and manipulation left nothing to be desired. As a consequence of its obvious merits, the Hardley mill was exploited with a great deal of energy, and made in considerable numbers by Messrs. Picksley & Sims, of Leigh, more than twenty-five years ago. The mill, however, ultimately declined in public favour, giving way to various forms of disc-grinders, and that for reasons which, at first sight, are somewhat obscure.

Woodroffe's mill, constituting a return to practice now more than a quarter of a century old, is, indeed, a case of mechanical "atavism," and, in view of its excellent performance at Plymouth, it may be interesting to inquire what it was that buried the Hardley mill before it was yet, mechanically speaking, dead.

The answer to this question is a purely technical one. It is a difficult task to make a satisfactory chilled and grooved roller, even of small dimensions, without the use of much more refined methods than were generally in vogue either in the foundry or in the fitting-shop twenty-five years ago; and the value of the Hardley mill depends entirely upon how good a "job" is made of the roller and concave. On the other hand, chilled discs are easily and cheaply produced, even in the most rudimentary foundry, and it happened that, while Messrs. Picksley & Sims made no effective arrangements for producing chilled rollers and concaves of high perfection, the disc-mill maker, working under less stringent mechanical conditions, became first a formidable, and lastly a deadly, competitor with the Hardley mill. It is because Woodroffe is now taking great pains, both in founding and grinding, to make a "good job" of his chilled roller and breast, besides putting sound work into his concave hinges and feed adjustment, that roller- and breast-grinding made such a good show at the Plymouth trials. But for the loss of some points on cost and sample (particularly in oats), the Woodroffe machine would have run an even closer race than it did with Corbett & Son's mill. In the result, however, it obtained the second prize.

Type V. Conical roller and breast-grinding with endwise delivery of the meal.—Messrs. Barford & Perkins's well-known "Felton" mill (No. 3363) consists of a conical grooved roller some 20 inches long, and tapering from $9\frac{1}{4}$ inches to $7\frac{1}{2}$ inches in diameter, cast of hard white metal, but not chilled. The cone

is grooved parallel to its axis with straight flutings about $\frac{3}{8}$ inch pitch and $\frac{1}{8}$ inch deep, and revolves, at a speed of 450 per minute, against similar flutes in a concave, also of hard white iron, which occupies the whole length, and half the circumference of the grinding cone itself. The concave is adjusted for coarse or fine grinding by means of set screws, which raise or lower it in parallel guides, and the two are trued up by grinding together with sand—a method which, it need scarcely be said, does not insure truly circular surfaces in either roller or breast. The mill is driven by strap direct, and the grain admitted to the small end of the grinding-cone. Thence it passes, more or less slowly, along the incline of the conical breast, till it is at length discharged as meal from the end of the mill.

A good deal of re-grinding necessarily takes place in the "Felton" mill, and showed itself on this occasion in heated meal, comparatively slow grinding, and heavy draught. Fine samples were produced, and although points were lost in the directions indicated, it is but fair to say that the Barford mill ran the second prize mill hard, the difference between the two, as determined by summing the points of merit, being only $3\frac{1}{2}$ per cent.

TABLE III.

Name of exhibitor	Catalogue No.	Material	Quantity of material	Time occupied	Total units of power consumed	Units of power required per cwt.	Quantity of material	Mean horse-power
			lb.	minutes			lb.	
Corbett & Son . . .	3460	Maize	56	2-33	562,120	1,124,240	1,442	7-31
		Oats		3-66	480,197	960,394	918	3-37
		Barley		3-27	495,321	990,642	1,027	4-59
Woodroffe & Co. . .	3441	Maize	56	2-13	483,718	965,436	1,577	6-86
		Oats		2-0	265,936	531,872	1,680	4-08
		Barley		3-47	603,712	1,207,424	968	5-27
Barford & Perkins . .	2420	Maize	56	3-23	1,203,644	2,407,288	1,024	11-12
		Oats		3-65	472,635	945,270	920	3-32
		Barley		4-58	1,380,094	2,760,188	733	9-13
Bamford & Sons . . .	3366	Maize	56	4-25	714,624	1,429,248	790	5-09
		Oats		3-05	507,935	1,015,880	1,101	5-04
		Barley		3-33	1,026,933	2,051,866	1,009	9-30
Blackstone & Co. . .	2565	Maize	56	6-75	1,638,468	3,276,936	497	7-35
		Oats		4-53	733,529	1,467,058	741	4-50
		Barley		6-58	1,618,302	3,236,604	510	7-45

CLASS 3.—Disintegrators.

Judges.

DAN. PIDGEON, C.E., Walsingham House, Piccadilly.

Prof. W. C. UNWIN, F.R.S., 7 Palace Gate Mansions, Kensington.

Prizes offered: FIRST, 20L., SECOND, 10L., for Disintegrators, suitable for working with a portable or traction engine not exceeding 20 horse-power.

Conditions of Trial.

The trials in this class will be conducted in a similar manner to those in Class 2.

The following will be the points awarded :—

1. Cost	20
2. Simplicity combined with strength, workmanship, and durability	15
3. Power taken to drive same	15
4. Uniformity of working and facilities for regulating same	10
5. Uniformity of produce	15
6. Attendance necessary	15
7. General adaptability for reducing various substances	10
	100

There are moments, sometimes prolonged into hours, during which, in every trial of implements, Judges acquire unsought and unwelcome opportunities for reflection; spaces of time, vacant of work but full of impatience, during which the Society's engineer, it may be, equally unhappy with the Judges, is cudgelling his brains for some mechanical expedient needed on the instant, or some half-nervous, half-belated exhibitor is re-splicing a strap that will *not* keep on the pulley, or even half-rebuilding his crude machine on the very trial ground.

Several such lacunæ (without responsibility on the part of the engineers, whose arrangements worked with perfect smoothness throughout) occurred during the disintegrator trials, and were utilised by the Judges in a discussion of the problem, "What, after all, is a disintegrator?"

This gravely disquieting, because fundamental, question was raised by the appearance at the trials of a mechanical "Banquo" in the shape of a bone-mill, which did excellent work operating upon such materials as a farmer wants to crush—e.g. bones and cake—but was altogether incapable of dealing with the thousand and one other materials, ranging from quartz-rock to rags, which the "Devil" readily tore into "Devil's dust." Happily, however, the progress of the trials themselves resolved a difficulty—which might, under some circumstances, have proved considerable—and made the awards easy.

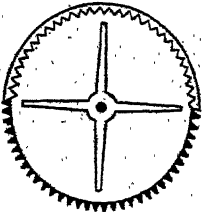
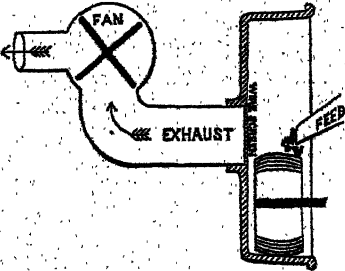
Eight disintegrators in all were entered for trial, but the number actually tested was four; three machines coming under the meaning of the word "duplicate," as defined by Regulation 34, while a fifth did not succeed in getting ready for trial at all. The following list (Table IV.) includes all the machines appearing for trial, arranged in the order of experimenting :—

TABLE IV.

Order of trial	Date	Name of maker	Catalogue No.	Price		
1	June 20	Hardy Patent Pick Co., Lim.	2539	£	s.	d.
2	"	J. Harrison Carter	3403	68	0	0
3	"	C. E. Hall, Robinson & Co. . .	3479	50	0	0
4	"	W. N. Nicholson & Sons . . .	3331	25	0	0
Not ready for trial	—	W. H. Coward	3485	65	0	0
				250	0	0

As in the case of the mills, considerable interest was given to the Disintegrator experiments by the fact that, five machines in all being present, four different principles of grinding were represented, as shown diagrammatically in Table V.

TABLE V.

System	Represented by
1. Toothed ring grinding with gradual reduction	Fig. 1.  Hardy Pick Co.'s "Devil."
2. Collision grinding	Fig. 2.  { Harrison Carter. Hall, Robinson.
3. Toothed roller grinding	Fig. 3.  Nicholson.
4. Edge runner grinding with exhaust delivery of product	Fig. 4.  Coward.

Type I. Fig. 1.—This illustrates incidentally the character of the question which, as already stated, thrust itself upon the attention of the Judges at a very early stage of the competition. The Hardy Patent Pick Company's machine, although called a disintegrator, cannot possibly be differentiated, as to its grinding principle, from a mill. Indeed, there is an excellent domestic coffee-mill, made by tens of thousands in Philadelphia, and sold all over the world, whose grinding surfaces cannot be distinguished from those of the "Devil" disintegrator, except in regard of size. Further, a certain C. M. Savoye, of Middlesex, patented a flour mill in 1832, which he thus describes: "The grinding surfaces in this mill consist of two concentric rings, having on their contiguous surfaces a series of teeth, cut in such a manner as to present cutting edges whether moved to the right or to the left. In the upper part" (or inner circumference of the grinding rings) "they project a quarter of an inch and diminish outward to a plain or even smooth surface, so as gradually to reduce the grain to fine flour." If, then, Nicholson's bone-mill be not truly a disintegrator, it is evident that the Hardy Pick Company's "Devil" is, equally with it, a mill.

Type II. Fig. 2.—The "Collision" mills of Messrs. Harrison Carter, and Hall, Robinson & Co., may be regarded as physical analogues of that spiritual "kicking against the pricks" condemned by the apostle as a waste of energy. Originating one knows not where, the idea of grinding by percussion has evidently taken some hold upon public credit. It consists in violently throwing, by means of rapidly revolving "beaters," the materials to be pulverised against the inner periphery of a cylinder, which, consisting of steel grids, permits such fragments as are struck off at each blow to pass through the interstices of the grids, while the body from which they are struck is still further beaten against the bars of its cage.

Type III. Fig. 3.—Toothed roller crushing, as already indicated, is one of the oldest of all methods of milling, and needs no description.

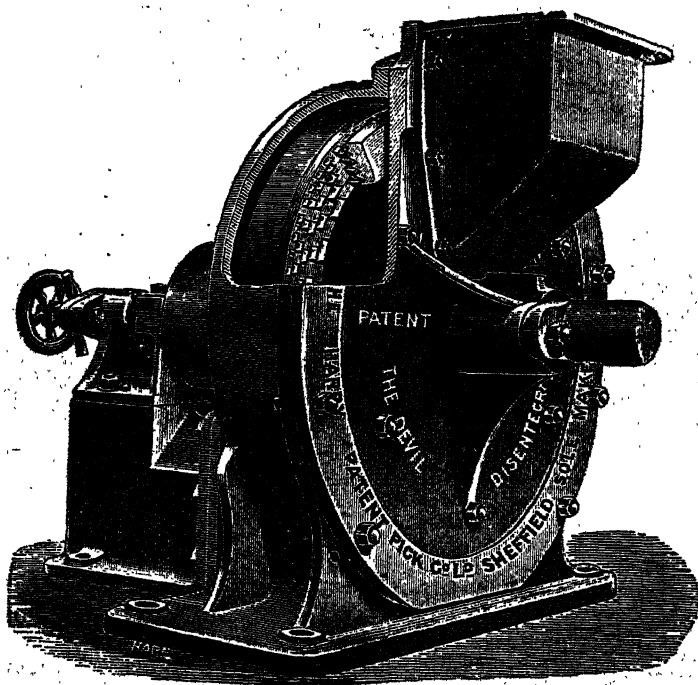
Type IV. Fig. 4.—An exactly similar arrangement to that of Coward's is described and figured in *Knight's Mechanical Dictionary*; balls being used instead of edge runners for grinding, while the ground material is carried away by means of a fan blast, exactly as in Coward's machine.

The trials of disintegrators took place on June 20, under similar conditions to those which characterised the mill trials, no change in the general arrangements being made, save that the dynamometer was furnished with stronger springs for the purpose of registering a higher horse-power. Preliminary essays,

made for the sake of adjustment, were taken no note of, and, during the trial proper, each machine received a measured dose, first of bones, and afterwards of cotton-cake. The time occupied in disintegration was noted by chronograph, while the power absorbed was registered continuously by the recording dynamometer, samples of the products being taken from time to time, as the work went on, for subsequent examination and judging.

The Hardy Pick Co.'s "Devil" disintegrator (No. 2539), which ultimately received the First Prize, was the first machine

Hardy Patent Pick Co.'s First Prize "Devil" Disintegrator.



tried. It consists of a pair of grinding rings, one fixed and the other revolving, whose contiguous surfaces are furnished with teeth arranged in concentric circles, and diminishing in size towards the peripheries of the grinding rings, but so disposed that each ring of teeth travels between similar rings of teeth on the opposing annulus, as shown in the accompanying woodcut.

The grinding rings are placed vertically within a strong wrought-iron cylindrical chamber, to which one annulus is bolted while the other revolves at the rate of 800 turns per minute. Adjustment is made, for fine or coarse grinding, by means of a set screw at one end of the spindle, operating against the opposing pressure of a spiral spring at the other end of the shaft, which itself is driven, without countershafting, by belt direct. All the moving parts of the mill are placed between the bearings, which are very long and adequate. Only three pairs of grinding discs, "coarse," "medium," and "fine," are employed in ranging from the coarsest to the finest work. They are of cast metal, having the teeth deeply chilled, are ground together with emery for the purpose of trueing up, and cost 2*l.* per pair, lasting from four to six months, according to the work. This machine is well designed and constructed, the workmanship and materials being first-class throughout. It occupies an over-all floor-space of 6 feet 3 inches $\times$ 3 feet 3 inches, and weighs 18 cwt.

After a short preliminary run, of which no notes were taken, the mill received 5½ cwt. of bones, which was finely ground (less ½ cwt. of material rejected by the operator as too large) at the rate of 13 cwt. per hour. Over-anxiety about the fineness of his sample spoiled the "Devil's" time on the first run, but a second dose of bones was disposed of at the rate of 1 ton per hour, while the sample still remained excellent. The machine next received 5·4 cwt. of cotton-cake, which was finely ground at the rate of 48 cwt. per hour, the draught in the case both of bones and cake being moderate. Reference is made, in the case of all the disintegrators experimented upon, to Table VI. (page 623) for a comparative statement of time, draught, &c. The mill worked with great steadiness, and was easily fed by one man.

The system of grinding adopted in the "Devil" disintegrator deserves some consideration. It combines the percussive action of what has been called the "Collision" mill with a shearing action which, progressing step by step, gradually reduces the material to be operated upon to any required degree of fineness. Meanwhile, although nothing can escape from the mill until it has reached the predetermined fineness, there is practically no re-grinding, and no loss of power from that cause. Again, the shearing action of the intermitted teeth, each upon the other, enables the machine to operate, whether upon wet or dry, brittle or tough, fibrous or non-fibrous materials. There are, probably, no substances, metals excepted, which could not be disintegrated by this machine, and its power to pulverise a great variety of

things has already made the "Devil" the parent of certain entirely new industries.

Among these there is, perhaps, no more interesting example than the conversion into manure of town and market refuse. Sheffield sends occasional contributions of mingled ashes, hampers, fish-bones, old boots, bottles, oyster shells, paper, vegetables, straw, and other "jetsam" to this ogre's den at Heeley, all of which, after going (with a pinch of lime for the sake of sanitation) through the "Devil's" maw, result in a digested mass of fertilizer, worth several pounds sterling per ton.

Mr. J. Harrison Carter's disintegrator (No. 3403) was the next machine brought to test. This, as before explained, is a "Collision" mill, and consists of a cylindrical chamber of cast-iron, within which four radial beaters of the best Lowmoor iron, steeled on their working faces, revolve at a speed of 3,500 revolutions per minute. Substances fed into the mill are violently thrown, with a velocity of from 300 to 350 feet per second, against the inner wall of the cylindrical chamber, which consists, as to its upper half, of chilled cast-iron serrations, and, as to its lower half, of concave steel grids, or "screens," the fineness of whose mesh determines the character of the grinding. Twelve grids, advancing step by step from $\frac{1}{4}$ to 2 inches, are used in practice, the mill being opened and the concaves changed as grinding of this or that degree of fineness is required. The beaters are disposed vertically, and are set to travel in three planes, covering the whole width of the beater chamber. They are driven through a countershaft by belting, and lie, together with the driving pulley, between the spindle bearings, which are long and adequate. The concaves, or grids, are built up of steel bars riveted, ladder-wise, to wrought-iron laterals, the "rungs" being few or many, according as the work to be done is coarse or fine. An "improved" grid was exhibited (though not used), wherein the rungs were merely slipped one by one into special laterals and secured therein by a locking-plate. The machine is well designed, and well and strongly made throughout, only the best materials and workmanship being employed—a necessity, indeed, where processes of such violence as those involved in a "Collision" mill are concerned. The disintegrator occupies an over-all floor-space of 3 feet 6 inches $\times$ 2 feet 6 inches, exclusive of counter-shafting and brackets, and weighs 11 cwt.

The trial proper began on bones, of which $5\frac{1}{2}$ cwt. were first served out, but the machine had not completed sixteen minutes' running when, warned by ominous noises, the exhibitor stopped it. On opening the mill it was found that a piece of iron

(presumably a bolt-head) had found its way in with the feed, and had so damaged the machine as to render more or less extensive repairs needful. The experience of less than half an hour's trial had made it evident that the grid is the "weak place" in the "Collision" mill, inasmuch as, being the most expensive part of the construction, and always under bombardment of the severest kind, it is peculiarly liable to costly damage.

It must here be remarked that the "Devil" received several pieces of iron with his bones, but these were all apparently rejected by the attendant, who, however, stopped once for a few seconds to open his discs, saying that he knew by the sound that a piece of metal was within; whether this was so or not, no damage was done.

The effect of the bolt-head upon the "Collision" mill was remarkable and instructive. One of the beaters was bent and cracked, one of the steel grids was much deformed, and rendered useless without a smith's repair, involving unmaking and re-making the "ladder," while the driving spindle itself was bent. Now bones are *never* free from iron, and while careful picking cannot insure their becoming so, electro-magnetic screening is, at present, only a scheme. The question therefore arises, "Is it not desirable that machines dealing with bones or town refuse, both of which always contain iron, should break, if they break at all, in the cheapest place?" Iron, entering the "Devil" disintegrator, comes first into collision, even when grinding fine, with the massive teeth surrounding the inner circumference of the grinding ring—teeth whose great length, and consequent strength, in the direction of the blow, give obstructions a chance of merely locking the rings and throwing the strap off the pulley. But in the case of the "Collision" mill, iron, entering with the feed, is flung with a speed of 300 feet per second directly against the grid, which, when the mill is grinding fine, must *necessarily* be a comparatively frail structure, yet all the more expensive because frail, since it consists of more and finer steel "rungs" than the coarser grids. The Judges did not therefore regret an accident which, while it was apparently a misfortune for the "Collision" mill, was, generally, an instructive event.

Later in the same day, the machine, having been repaired, was restarted; but, in the meanwhile, $2\frac{1}{2}$ cwt. of bones had been ground, before the accident occurred, at the rate of 10 cwt. per hour (see Table VI.) and at a considerable expenditure of power. A quantity of bones, equal to one-sixth of the material ground, was rejected by the feeder, who, indeed, threw out every large piece, together with any hoof or horn that

occurred. Two concaves of $\frac{1}{2}$ -inch mesh and two of $\frac{1}{4}$ -inch mesh were employed in bone-grinding, and the sample produced was very good.

The machine was tried a second time upon cotton-cake, of which 4 cwt. was ground at the rate of 20 cwt. per hour; but, again, with a large comparative expenditure of power. Grids of $\frac{1}{4}$ -inch mesh were employed, and the sample was good but dusty.

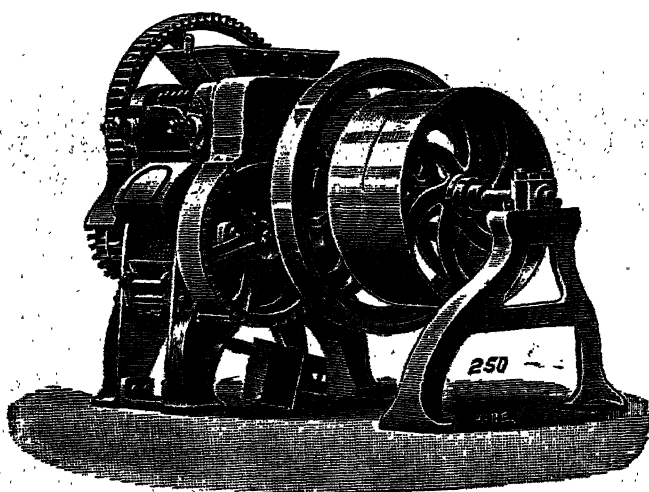
The trial of Messrs. Hall, Robinson & Co.'s machine (No. 3479), which is a rather roughly made reproduction of the Harrison Carter mill, already described, ended in a complete fiasco. Within five minutes of starting on his preliminary run, his strap, which from the first was mutinous, broke, and some changes, involving the free use of saw and axe, had to be made in the platform supporting the mill before this could start again. Difficulties with the strap recurred on starting a second time, nor could the efforts of two men, coaxing the belt with hammer shafts, induce the latter to keep on the pulley. Meanwhile, the machine refused to receive anything but the smallest pieces of bone, which were pushed, either by means of a stick or the feeder's hand, in a most dangerous way, into the body of the unwilling disintegrator. All large bones were rejected, and the rate of feeding was extremely slow. Before the operator had got through a fourth of his "preliminary" bones, the fast-slackening strap again rebelled, and attempting, in spite of hammer shafts, to mount, now the bearing, and now the body of the machine itself, finally struck work for the third time, and thus brought the "trial" to a close.

Messrs. W. N. Nicholson & Son's "Bone Mill and Disintegrator" (No. 3331), which took the Second Prize, was the next machine tried. It consists of two pairs of toothed grinding rollers, one of coarse and one of finer pitch, set one above the other, an arrangement so well known in bone and cake mills as to need no further description. The mill is well and strongly made of the best materials and workmanship, while the roller adjustments, together with the provisions for allowing hard foreign substances to pass, are well considered and effective. The grinding rollers consist of separate discs of cast steel, which are interlocked one with the other for the purpose of diminishing galling of the square driving shaft, upon which the discs are loosely threaded. This bone mill occupies an over-all floor-space of 6 feet $\times$ 5 feet 6 inches, and weighs 28 cwt. It is driven by belting direct from the motor, the necessary reduction of speed in the crushing rollers being provided for by self-contained gearing.

The machine was first set to work on 5.125 cwt. of bones, which it disposed of at the rate of 19 cwt. per hour, making rather coarser work than the "Devil" and Harrison Carter had done, but producing a satisfactory sample for farmers' use. Meanwhile, the power absorbed was very moderate, while no rejections of material were made by the attendant. It was, indeed, a remarkable sight to watch, as might be done in this case, the toothed rollers crunching up huge horse heads and shoulder blades as if they relished the gruesome meal.

The second trial took place on cotton-cake, of which 5.8 cwt. was reduced to small fragments, rather than powder, as in the

W. N. Nicholson & Son's Second Prize Bone Mill and Disintegrator.



other cases, at the rate of 21 cwt. per hour, the sample being, again, quite satisfactory for feeding purposes, although not finely ground.

Nicholson's machine, is not a disintegrator in the same sense as the "Devil," is, undoubtedly, capable of dealing very satisfactorily with such materials as bone and cake, though it would altogether fail in producing manure, as the "Devil" does, from town refuse. In economy of power the machine, indeed, heads the list (see Table VI. opposite), but in "general adaptability for reducing various substances" it lost many points, yet came easily into the second place. Meanwhile, the differences in character and function between the first and second prize

machines are so great that no attempt will be made, as was done in the case of the mills, to attach relative figures of merit to these two competitors. They occupy each such different ground that any such attempt would be misleading. For the man who wants to disintegrate *everything*, the "Devil" stands ready; for the agriculturist who only wants to grind bones and cake, Nicholson's machine furnishes all that he desires.

Mr. W. H. Coward's Disintegrator (No. 3485) did not come to trial at all. The machine, instead of being in place, under Regulation 6, ten days before the Show, was not completely erected until after the disintegrator trials had ended, so that the Judges were compelled, very unwillingly, to pass it by. While, however, they regretted Mr. Coward's disappointment at missing a trial which, he naïvely confessed, would give himself valuable information, not yet in his possession, as to the capacities of his own machine, they are sure that nothing was lost to agriculture by the lapse in question. Mr. Coward's machine was quite unfitted—whether by its massiveness, its high price, or its confessed inability to deal either with bones or cake—for a farmer's use, and if it could have been set to work upon limestone chips, as the exhibitor desired, nothing of any value to agriculture could have been demonstrated. The case, indeed, is one where a fuller knowledge of what was really wanted would have saved the exhibitor much disappointment, and, it is to be feared, a heavy and useless expenditure of money.

TABLE VI.

Name of exhibitor	Catalogue No.	Material	Quantity of material	Time occupied	Total units of power consumed	Units of power required per cwt.	Quantity per hour	Mean horse-power
			cwt.	min.			cwt.	
Hardy Patent Pick Co.	2539	Bones	5·97	18	9,198,150	1,589,950	19·90	15·48
		Cotton-cake	5·40	8·75	2,230,000	412,963	48·0	10·0
Nicholson & Sons . .	8331	Bones	5·125	18	3,406,600	664,702	19·2	8·45
		Cotton-cake	5·82	16·5	1,359,600	230,171	21·1	2·45
Marriott Carter . . .	8403	Bones	2·63	16	4,563,300	1,735,095	9·8	8·64
		Cotton-cake	4·06	13	2,265,500	809,817	20·3	3·24

The thanks of the Judges are hereby tendered to the Stewards of Implements; to the Engineering Staff, for technical assistance promptly and courteously rendered; to Messrs. Davey, Paxman & Co., for the loan of their excellent motors, which did yeoman's service; and to Messrs. Avery & Co., for the use of weighing machinery.

DAN. PIDGEON.

MISCELLANEOUS IMPLEMENTS EXHIBITED AT PLYMOUTH.

IN the Implement Catalogue of the Plymouth Meeting, pp. xx. to xxiii., it is seen that, out of upwards of ninety exhibits entered as "New Implements," competing for Silver Medals, ten are marked thus *, showing that they were also entered for competition in Classes 2, 3, and 4, for money prizes. As these competitions are the subject of special papers, entries so marked will not be noticed here.

As it is not possible to give full details of mechanical construction, or an exhaustive consideration of adaptability to agricultural requirements, all that will be attempted by the writer is to call attention to the more salient points of both in some of the more noteworthy exhibits, leaving it to the wisdom of an intending purchaser to satisfy himself, before buying, that the appliance is capable of doing its work efficiently.

The entries which are the subject of this notice will be taken in their catalogue order, precedence being given, however, to those which were, on the recommendation of the Judges (Messrs. Thomas Stirton and James Edwards), awarded Silver Medals, viz., Articles 381, 710, 2539, 3333.

SILVER MEDALS.

Messrs. T. Bradford & Co.'s "Arch Albany" Butter Worker (Art. 381) differs from the Workers now in ordinary use in three important particulars:—

The table (see fig. 1) forms, instead of an inclined plane, an arch with a rise in the centre of something like $2\frac{1}{4}$ inches; the roller, instead of being a fluted cylinder, takes the form of a wooden screw with threads of a somewhat similar section to that of the flutings on the old roller; and, thirdly, galvanised malleable iron grooves, arched to follow the line of the table, ensure the true working of the side guide rollers, and at the same time give great strength and rigidity to the whole structure.

This machine was tried in the Dairy, with some 9 lb. or 10 lb. of butter, by Miss Maidment in the presence of the Judges, and, though using it for the first time, she considered that the butter was thoroughly worked in one-third less time than would have been required by a worker of the old type, and it is quite possible, as is claimed by the Exhibitor, that butter might be worked in *half* the usual time by any one accustomed to its use. This important saving of time is without doubt due to the arched table and the screw roller. The buttermilk escapes at

both ends of the table instead of one, and has only *half* the distance to travel. The onward pressure of the screw has a tendency to drive the buttermilk in front of it, instead of pressing it downwards, and at the same time leaves behind channels on the surface, of the best possible form for the buttermilk to run down. There is less mopping to be done, and the roller is more easily wiped and cleaned. Time, which means money, is saved here, and it may be well to state that the extra cost of the new Worker is only about two shillings.

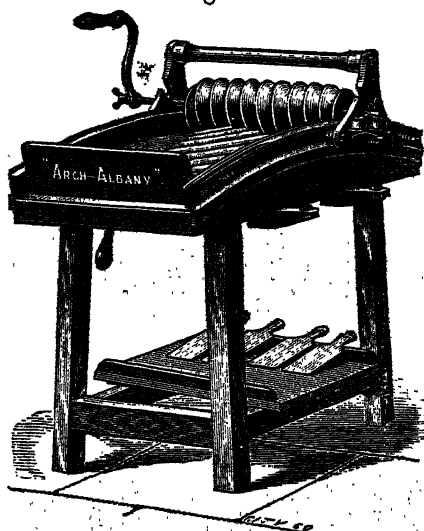
The Dairy Supply Co., Limited, for the application of a Refrigerator between the Churn and the Separator in an

Instantaneous Butter Maker (Art. 710). This contrivance may fairly be described as a wonderful development of dairy machinery, and it is not too much to say that nothing in the Show-yard attracted more attention. If we had not of late years been educated up to it by such a machine as the cream separator, we should be the more astonished to see new milk converted into the three products, skim milk, butter, and buttermilk, as fast as it can run from a tap.

The entire apparatus consists (Fig. 2) of several parts, viz.—a holder or tub for the milk; a warmer to raise the temperature of the milk before passing into the separator, of the ordinary kind; the separator, driven by a steam turbine of improved construction, with one steam outlet instead of two as formerly, and which it is claimed takes less power to drive; a refrigerator, of improved construction, with internal diaphragms which cause the whole of the cold water to pass close to the inner surface of the metal, over which the cream is spread before passing into the churn. The churn is a horizontal cylinder, some 12 in. long by 4½ in. diameter, outside measurement, with a centre spindle carrying straight wire beaters parallel to, and of nearly the same length as, the churn. This spindle is driven by a cotton rope belt, from a pulley on the separator spindle, at a speed of 3,000 revolutions a minute, or half that of the separator.

In the trial, 250 lb. of milk was weighed, mixed, and put in the holder at a temperature of 65°. The separator was started

Fig. 1.



at 11 hours 54½ minutes, milk turned on 11 hours 58½ minutes, milk through 12 hours 15 minutes, washed out with 2½ gallons of skim milk, and finished 12 hours 17 minutes.

Fig. 2.

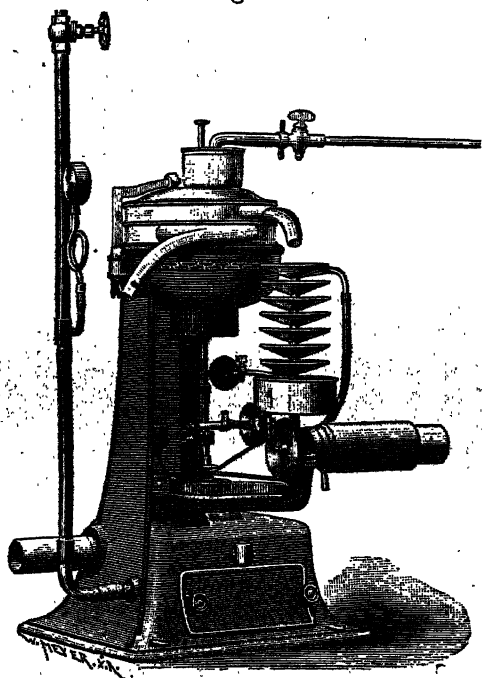
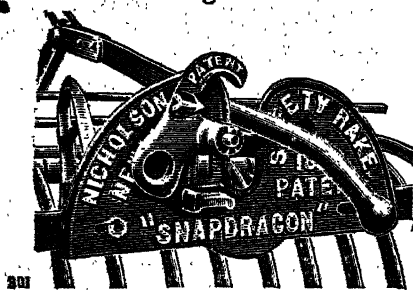


Fig. 3.



This is an important novelty attached to the rake (see fig. 3).

The hook is pivoted on a plate which is fixed on the stripper bar and slotted to receive the back lever. When the teeth fall, the lever strikes the upper part of the hook, which falls back

The warmer raised the milk from 65° to 85°, and the refrigerator reduced the cream to 56°. The butter, which came continuously and in fine granules, when made up weighed 9lb. 2 oz., and was pronounced to be of excellent quality, with good grain and free from buttermilk; it is most probable that the superiority of the butter to that made by the Extractor last year at Windsor is due to the refrigerator.

The Hardy Patent Pick Co., Sheffield—Disintegrator. (Art. 2539). This machine has for two years been sent forward for trial as a "new implement." It is described under the head of Disintegrators (page 617).

Messrs. W. N. Nicholson & Sons, Newark—"Snapdragon" Horse Rake (Art. 3333), for a Balance Snap Hook.

and allows the lever to pass under it, but comes forward into the right position, at exactly the right moment, to check the rebound of the lever, and, having done so, for an instant allows the lever to rise, and the hook resumes its normal position when at rest. The evil which this snap hook prevents is the tendency in some rakes, on the rebound of the lever, to throw the pawls again into the wheel ratchets, and strain the gearing. The front bar in this rake is trussed to prevent any tendency to bend or twist.

This completes the record of the awards of Silver Medals.

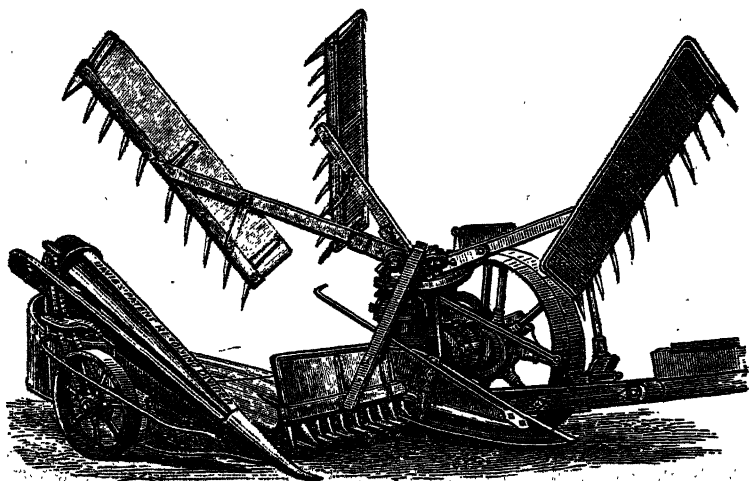
Messrs. Davey, Sleep, Harris & Co. exhibited (Art. 16) a Charlock Cleaner and Horse Rake combined. This has been recommended by the Judges to be allowed to compete as a new implement next year. The inventors have not had time as yet to perfect some of the details of construction, and did not wish to press it on the notice of the Judges. Still, it is only right that they should have credit for bringing out this implement, which already gives great promise of successfully dealing with the nuisance of charlock in corn crops, the attempt to do which has hitherto been more or less a failure. Charlock, as is well known, is not always to be taken as an indication of bad cultivation, its increase being generally the first result of deeper tillage. Such an implement as this would, therefore, benefit the good farmer, and is the more to be desired.

The Charlock Cleaner is hung below the axle of the horse rake on vertical arms attached to the frame next the wheels, and consists of a fixed cutting bar somewhat similar to that of an ordinary mower, but with larger sections or blades, having immediately above it and parallel with it a long rotary brush which gathers and presses the charlock against the knife bar where it is cut and dropped behind the implement. The brush takes its motion from the driving wheels of the rake. The Cleaner is easily detached from the rake and can be set to cut at any height required. In making use of the rake frame to carry the Charlock Cleaner a great economy is effected, and the width of cut necessary for rapid work is obtained without reducing the efficiency of the horse rake when used as such.

Mr. J. N. Davies, Gweleath, Cornwall, exhibited (Art. 208) a Revolving Divider Attachment for all kinds of reapers. This is intended to deal with what is often the greatest difficulty in cutting laid and twisted corn, especially with self-binders. Mr. Davies exhibited one of his Dividers which had been through 100 acres of corn last year, and was stated to have given great satisfaction.

It consists (see fig. 4) of a slightly tapering wooden cone, fluted parallel with its length, which is about 2 ft. 6 in., its diameter at the small end being about 3 in., and at the large end about 6 in.; it is fixed on the upper edge of the dividing board, and is made to revolve from the standing corn by a chain from the wheel carrying the dividing shoe.

Fig. 4.



Mr. J. Best, 24 Old Town Street, Plymouth—Patent Automatic Valve (Art. 213), for intermittent working of Hydraulic Rams. This was shown at work, and appeared well finished and of good construction, acting with great certainty. It is improved in several details, especially in the balance bar, which is a hollow tube containing 7 lb. of mercury. The fluid metal runs from end to end, as the rising and falling of the float brings it over the centre of balance, with sufficient force to ensure the opening and closing of the valve. On many farms, where good springs of water exist and a suitable fall can be obtained, but perhaps without a sufficient supply of water to work a Ram continuously, by means of a small tank and a valve of this description a Ram can be worked intermittently without attention and with good results.

Mr. C. R. Valentine, Ludlow, showed an "Acidimeter" (Art. 284). This is an apparatus for testing the degree of acidity in cream, milk, whey, curd, &c., and comprises a set of specially graduated test-tubes and chemical reagents, the whole fitting compactly into a mahogany case. When worked by the inventor good results were obtained, but it appeared to require rather more skilful manipulation than the ordinary farm dairy could command. The same was the case with this Exhibitor's Milk Tester (Art. 285).

Messrs. T. Bradford & Co.'s Dairy Table (Art. 384). In the centre of this table is an improved "making up" press, worked

both by hand above, and by foot and treadle, giving a vertical pressure from below, causing the butter instantly to take the form of the chamber or box in which it is placed, in much the same way as pressed bricks are made. This table would be likely to find a place in factories and large dairies.

Mr. T. B. Burns, North Cornwall Works, Camelford, exhibited a Hurricane Lantern (Art. 666), for use by shepherds and stockmen in warming milk for feeding lambs, &c. A tin bottle to hold the milk fits into a horizontal chamber in the top of the lamp, and is thus kept warm without trouble or attention at a distance from the house. If found to answer this purpose, there are many farmers who would find it useful.

The Aylesbury Dairy Co. showed "The Danish" Hand Separator (Art. 751), to separate thirty-five gallons of milk per hour. The novelty claimed is the addition of a "cream regulator" to a hand separator, with the object of making thick or thin cream at pleasure, without altering the feed, or the speed, or the quality of the skim milk. On trial it worked up to the rate of nearly thirty-five gallons per hour, with a speed of 6,000 revolutions, but analyses of two samples of skim milk, one taken while making thick, and the other while making thin cream, showed an appreciable difference in the percentage of butter fat.

The Western Counties Agricultural Co-operative Association, Plymouth, exhibited (Art. 807) a Farm Weigh-bridge. This is recommended to be allowed to enter as a new implement next year, as it already holds out great promise of meeting an urgent need, viz. better facilities to farmers for weighing their stock and produce at home. At present a farmer is exceptionally fortunate if he is within reasonable reach of a weigh-bridge, whilst to have one on his own farm is almost out of the question, unless it is a very large occupation.

Messrs. Allan Jones & Co., Gloucester, showed a Fowl House (Art. 952). The system of keeping poultry in movable houses is on the increase. In this one the whole floor tilts outwards, is easily cleaned, and is strong and well made.

Messrs. W. & T. Avery, Digbeth, Birmingham.—Weighing Machine and Cart Combined (Art. 1292). It is difficult to see what is the object of this combination. Perhaps it is fortunate that both the weight of the machine, and of the money required to buy it, put it quite out of the reach of any ordinary farmer.

The same Exhibitors had a Weighing Machine and Waggon Combined (Art. 1293), to which the above remarks apply with greater force. The fact would appear to be altogether lost sight of that farm horses probably do more than half their carting work

on soft land and bad roads, otherwise carriages of this weight would surely not be offered to farmers.

Mr. T. H. Brigg, Bradford, exhibited an Automatic Easy Draught Attachment for Carts (Art. 1363). This was shown at Windsor, and the only claim to novelty this year is the adjustment of the traction levers in such a manner that their action multiplies in proportion to the resistance of the load. From a few practical tests which the Judges applied to the invention, there did not appear to be any extraordinary diminution of effort in consequence of its use. The tests were of course rough and ready ones, and did not pretend to be scientific or exhaustive; but I think we were justified in supposing that so great an advantage to the horse as is claimed in this attachment should be evident to the eye without the assistance of a dynamometer.

The end that Mr. Brigg has in view, viz. controlling the angle of draught to suit the constantly varying conditions of the horse's work, is a most important one to farmers, and too often lost sight of, or we should not so frequently see horses flogged to get a heavy load up a hill, when a sack or two transferred from the waggon to the horses' backs would enable them to pull it with the greatest ease. Neither should we so often see horses yoked at length instead of abreast—a lamentable loss of power. I hope Mr. Brigg will persevere until he gives us a strong, simple attachment, suitable for agricultural carriages, and such as may effect a great saving of horse-flesh.

Messrs. Wm. Brenton & Co., Polbathic, St. Germans.—Corn-sower, broadcast (Art. 1386). In this implement the seed-deliverer consists of a roller having a concave surface (like a pulley wheel), with a number of curved teeth round its smallest diameter adapted to move the grain towards the discharge opening.

Mr. R. H. Williams, Liskeard—a Turn-wrest Digging Plough (Art. 1433). In giving this plough a field trial, the Judges do not wish it to be thought that they themselves are in favour of turn-wrest ploughs for general purposes. They think the verdict of the country is against their use; but their reason for the trial was that they understood that these ploughs are very commonly used in the Plymouth district. They therefore thought it their duty to test Mr. Williams's plough, as the principle on which it works is, they think, new, and has a good deal to recommend it. The general construction, however, scarcely does justice to the principle.

The breast and sock swing together on an upright pivot fixed to the centre of the beam, right or left as required, by means of worm and spur gearing, with a long iron connecting rod, and crank handle within reach of the ploughman. The coulter is reversed with a simple crank, worked by a light rod, also convenient to the ploughman.

To form continuity with the breast, and on either side of the plough, is a wing, the front edge of which constitutes a support to the rear edge of the breast, when at work. These wings can be raised or lowered according to the depth of the furrow, which they assist in turning and breaking.

This implement was tried on land that had been ploughed and cultivated for turnips, and on which a heavy dressing of long farm-yard manure had been spread. The land was wet and turned up sticky; moreover, there was no one who had been used to the implement present to manage it. The reversing gear worked well. The plough seemed to take a heavy draught, probably because the breast was not of the best shape for reducing the suck. It is difficult to say with certainty whether this could be remedied by slightly altering the pattern, remembering, however, that the reversing principle requires that the outline of the edge, which the sock and breast together form, shall be a suitable outline when the same edge forms the rear of the breast. In lightness and cheapness this plough has a superiority over its rivals, and it could with great advantage be further lightened and stiffened by reducing the length of the stilts and increasing the spread at the handles. It also requires a better bridle head.

Mr. H. S. Crump, Gloucester, showed a Pig-trough (Art. 1941) which tilts outwards conveniently for feeding or washing out.

Messrs. P. J. Parmiter & Co., Salisbury, showed a Patent Flexible Harrow (Art. 1962). In this harrow, instead of the link and tine being made from a single steel rod, the link is formed as before by looping the rod in the centre; but in place of carrying the ends down to form the tine after forming the corner loops, these loops are punched vertically to receive the tine, which has its upper end bent round the link, and cannot get out of place. The tines are easily renewed, are made of the best steel, $\frac{3}{8}$ or $\frac{7}{16}$ of an inch diameter, and have great power of penetration. In fact, these harrows are said to be used for pulling up and levelling the surface of a turnpike road previous to rolling.

In the Horse Rake of the same Exhibitors (Art. 1963) the chief novelty is jointed clearing rods, which hang between the teeth, clearing them as soon as they begin to lift.

Messrs. C. F. Millar & Co., Shirehampton, Bristol—Flexible Iron Harrow (Art. 2117). A strong, well-made implement. It can be worked either end forward, which keeps the teeth sharp, and it can be reduced in size in a few minutes to suit the work or the size of the horses.

The same makers—Collapsible Iron Hurdle (Art. 2418). This is an invention of considerable value, as not only can the

hurdle be easily taken to pieces and put together by a farm labourer, but, as every part is interchangeable, old hurdles will make up almost as good as new. The bars are not weakened in any way at the point of connection with the angle iron heads. These hurdles are well adapted for colonial use.

Messrs. Lankester & Co.'s "Keystone" Hay-loader (Art. 2129). This machine is an elevator for attachment behind a waggon, and is carried on a pair of travelling wheels which drive a pronged cylinder of the nature of a hay-tedder. Over this cylinder an endless net travels, and elevates the hay to the point of delivery above the waggon. The hay is picked up in the windrow.

William Lambert, Staplehurst, Kent—Hop Washing and Fire Engine Combined (Art. 2192). The chief novelties in this machine are regulation of the pumps with speed wheels of different sizes, hose nozzles instead of perforations, and the power of using it as a fire engine, equal to $\frac{1}{2}$ -horse.

Messrs. Powell Brothers & Whitaker, Wrexham—Potato Sorter (Art. 2284). A good implement—low hopper, hung on four chains, gives great freedom of motion with no wear and tear.

Messrs. R. A. Lister & Co., Dursley, Gloucestershire—Horse Gear (Art. 2402). The chief novelty consists in the first motion being taken from three different points, with the object of dividing the strain. It multiplies sixty-four to one, which, with 24-inch pulley, will drive a separator 7,000 revolutions a minute, and does away with the necessity for intermediate motion. The lay shaft is kept nearer the ground than is usually the case, and is fitted with a safety clutch of special design that can be attached at either end. Only one keyed wheel is used. Whether the novel construction reduces friction appears open to question, but, as we did not test this point, we do not express an opinion.

The same makers' "*Alexandra*" Cream Separator (Art. 2404) consists of a milk holder in which the milk, before entering the Separator, is heated to 80° by means of a jacketed steam chamber which forms the bottom; then from three to four inches above this a loose diaphragm rests on a small ledge in the side of the tub; this checks the heated milk in rising, so that the bulk of the upper milk remains comparatively cool. On leaving the Separator the skim milk is passed through a jacketed vertical cylinder and boiled, after which it is cooled over a refrigerator and canned for sale. The milk is prevented from scumming, or sticking to the sides of the boiler, by an ingenious stirrer revolving slowly inside it.

Messrs. Barford & Perkins, Peterborough—Ensilage, Field, and Cambridge Roller (Art. 2423). Combined implements are often objectionable, but the objection hardly applies in this case,

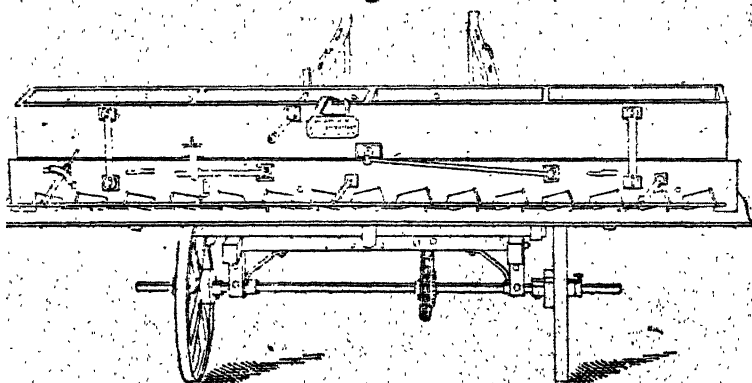
as without detriment, or complication of construction, a roller, suitable for nearly every purpose, is placed within the reach of almost any arable farmer at the small price of 21*l*. Rollers are expensive implements, and small farmers are generally dependent on borrowing from their neighbours, or, worse still, use one unsuited to the work—an evil which this invention goes far to remedy.

It consists of a water ballast cylinder, which makes a light or a heavy smooth roller; Cambridge rings slip on to this, and it can then be used as a clod-crusher, light or heavy as required. With the frame and shafts removed it becomes an ensilage roller.

Messrs. Blackstone & Co., Stamford, exhibited their Rutland Mower (Art. 2570). The cutting bar in this mower has perfect freedom of motion, not only in a vertical line, but also in the angle which the fingers may take in relation to the horizontal. In other words, the "tilt," usually given with a lever provided for the purpose, is here automatic, and, more than this, the tilt is entirely governed by the lead wheel, but is beyond the control of the driver. This, we satisfied ourselves by a trial in the field, constitutes a serious objection to what is otherwise a clever mechanical movement.

Mr. G. Greenfield, Eakring, Newark, Nottingham, showed a Distributor (Art. 2797).¹ This machine (fig. 5) is recommended

Fig. 5.



to be entered as a new implement next year by the Judges, who however were able to try it sufficiently in the Showyard and in the field to satisfy themselves that the appliance, though somewhat roughly constructed and evidently hurried forward for the

¹ By inadvertence of the Exhibitor this machine was numbered 2807 instead of 2797.

Plymouth Meeting, is already capable of good work, and with a little more attention to detail from the inventor will become a very efficient machine. It will sow artificial manures of any kind, damp or dry, in almost any quantity, from one cwt. to two tons per acre, and will pass stones or other hard lumps, up to $1\frac{1}{2}$ inch diameter, without choking. The head of the spreader is reversible, having brushes on the opposite side when required to sow broadcast grass seeds or corn. This it does with great regularity. The intermittent stirrer, which is a plain sliding board in the back of the hopper, is a very important feature, as in sowing damp manures it gives just the right amount of motion to keep up a constant supply to the delivery holes, without turning it into a paste. The lower front board of the hopper, carrying the discharge holes, has a lateral alternating motion given to it by a small crank with a three-inch throw. This board on the inner side has small iron pegs projecting inwards, which move the manure in the hopper to prevent sticking. The size of the discharge holes is easily adjusted. The first motion is given by a chain from the main axle.

The same stand (Art. 2798 to 2801) contains a distributor to attach to the back of a cart; a machine to sow turnips, mangel, and manures; a broadcast barrow for grass seeds; and lastly, an eight-foot grass seed sower, to sling on the shoulder and work by hand. These machines have considerable merit, but it is not necessary to say more, as the same general principle runs through all. The grass seed barrow on trial showed no undue tendency to separate the grass from the clover seeds, as is sometimes the case.

Mr. John Huatable, Castle Hill, South Molton—Chain Harrow (Art. 2832). Possesses malleable iron links of peculiar shape to cause the teeth to take a greater number of tracks; the links have anti-locking joints to prevent tangling.

Messrs. R. Hornsby & Sons, Limited., Grantham—"Hornsby" Reaper (Art. 3143). This is a self-raker. The four rakes are driven by chain wheel direct from the axle of the driving wheel, which gives the slow speed required, and obviates the necessity for intermediate gearing, which was formerly used when the first motion was taken at a high speed and had to be reduced by this means. All the rakes are controllable, and deliver, or miss, at pleasure, depending on the use of a bell-crank lever worked by the foot of the driver. The rakes can also be made to work automatically, as required. One lever puts both the clutches that drive the rakes, and the knife, respectively, in gear simultaneously. As far as could be judged in the Showyard, this appeared to be an excellent machine.

The "Hornsby Hoosier" (Art. 3145) is a Corn and Small

Seed Drill. It is a ten-row drill, and two horses work it easily; it is light and well constructed, having the general appearance of some of the American makes, due to the larger use of steel with malleable and wrought iron in its various parts. The weight of this drill is 740 lb. It has an indicator to show the acreage sown. The action of lowering or raising the coulters puts the drill in or out of gear at the same time. This is done by means of a wedge-shaped clutch-fork. The nose of the coulter is renewable, of hard steel, and of a good shape, which would tear rather than cut its way through the surface. The coulters have a release trip which enables them to "kick out behind," if I may so describe it, to free a stump, or fast stone, and prevent breakage.

Mr. J. H. Carter, 82 Mark Lane, E.C.—Magnetic Separator (Art. 3405). For taking out old iron, horse-shoes, nails, &c., from among bones, before crushing, to avoid injury to the mill. This is done by passing them down a shoot at the foot of which is a revolving drum, studded with magnets, worked on an intermittent principle from a dynamo. By means of these magnets any pieces of iron are attracted on the upper side and dropped on the lower side of the drum, while the bones are delivered on to a platform beyond the drum. This principle of separating waste iron from other waste metals, such as brass and copper, has long been in use in engineering works, but is probably novel in its present application. The Magnetic Separator did its work well, and may be said to be indirectly an agricultural implement.

Messrs. Barnard & Lake, Rayne Foundry, Braintree, Essex—Thatch-making Machine, "The Spider" (Art. 4122). It is satisfactory to the writer, as one of the Judges who awarded to this machine the special prize of 25*l.* offered by the Society for the best "Apparatus for making thatch for the covering of stacks," at the Norwich Meeting, in 1886, to know that in the following year it was so greatly improved as to warrant the award of a Silver Medal, and to meet with it again at Plymouth, still "new" as ever, or at any rate so much improved as to warrant the term, within the meaning of Rule 26. The machine has been reduced both in weight and in price. Another improvement is in mounting and driving the feed rollers so as to admit of parallel adjustment. An important novelty, too, is a device for drawing the string from the supply, in such a way as to effect equalization of tension and prevent breaking. The stitch can now be made long or short as required. The use of steel tubes in the construction of the frame assists in reducing the weight and adding to the strength, though in this respect the machine has never been deficient.

JAMES EDWARDS.

Official Report.

QUARTERLY REPORT OF THE CHEMICAL COMMITTEE.

JULY 1890.

1. Mr. W. Moore, of Noverton, Stanford Bridge, Worcester, sent for analysis on April 28, 1890, a sample of what he described as "wool manure."

The following analysis was returned on May 6 :—

Moisture	27.28	} 100.00
¹ Organic matter	66.46	
Oxide of iron and alumina	1.24	
Alkalies, &c.	3.18	
Insoluble silicious matter	1.84	
¹ Containing nitrogen	0.68	
Equal to ammonia	0.83	

This is not wool at all, but only cotton. It is practically worthless.

2. Mr. R. Marshall, of Ley Fields, Kneesall, Newark, sent for analysis on May 22, 1890, a sample of pure dissolved bones (so called). The analysis returned to him on May 29 was as below :—

Moisture	12.60	} 100.00
¹ Organic matter and water of combination	22.98	
Monobasic phosphate of lime	15.84	
Equal to tribasic phosphate of lime (bone phosphate) rendered soluble by acid	(24.81)	
Insoluble phosphates	14.81	
Sulphate of lime, alkaline salts, &c.	32.52	
Insoluble silicious matter	1.25	
¹ Containing nitrogen	1.02	
Equal to ammonia	1.23	

* This is not "Pure Dissolved Bones"; it is a dissolved boiled bone.

The manure was invoiced "Pure Dissolved Bones."

3 & 4. Mr. T. S. Walker, Kiveton Hall, Kiveton Park, Sheffield, sent on June 11, 1890, two samples of Pure Dissolved Bones for analysis. Both were invoiced "Pure Dissolved Bones."

The following analyses were returned on June 19 :—

Moisture	9.05	9.85
¹ Organic matter and water of combination	24.35	28.80
Monobasic phosphate of lime	16.01	13.39
Equal to tribasic phosphate of lime (bone phosphate) rendered soluble by acid	(25.06)	(20.98)
Insoluble phosphates	15.59	24.75
Sulphate of lime, alkaline salts, &c.	32.51	27.36
Insoluble silicious matter	2.49	.85
	100.00	100.00
¹ Containing nitrogen	1.79	1.24
Equal to ammonia	2.18	1.51

The analyses were accompanied by the following report :—

Neither of the samples is pure dissolved bones—i.e. a manure made *entirely from raw bones and acid*. They do not contain admixture of mineral phosphate, but the bone used in the manufacture instead of being *entirely raw bone* is *steamed or boiled bone*. The ammonia, in consequence, is only about half what it would be if raw bone entirely had been used.

5. Mr. Alex. Iles, jun., of the Park Farm, Fairford, sent on May 17, 1890, a sample of linseed cake for analysis. Three tons had been supplied at 7*l.* 15*s.* delivered (cash at two months), by Mr. James Snowsell, Cirencester, agent for the Cotswold Association "for the supply of pure and unadulterated Artificial Manures and Feeding Stuffs." The manufacturers of the cake were Messrs. Walker & Smith, Limited, of Hull. When sending the sample, Mr. Iles wrote :—"Strange to say, my lambs, fattening-sheep, and calves do not clean up the cake in their troughs." The following analysis was returned on May 29 :—

Moisture	12.63	100.00
Oil	7.09	
¹ Albuminous compounds (flesh-forming matters)	24.75	
Mucilage, sugar, and digestible fibre	33.23	
Woody fibre (cellulose)	13.26	
² Mineral matter (ash)	9.04	
¹ Containing nitrogen	3.96	
² Including sand	3.99	

An abominably dirty, impure cake. It contains a large admixture of hemp, rape, earth-nut, with some cotton-seed, and the seeds of locust-bean. Such a cake has no right to be called a linseed-cake.

On the invoice it was described as "Lins. Cake," and Mr. Iles also wrote :—

In selling me this cake the vendor *verbally* guaranteed it to contain 13 per cent. oil. . . . I bought 2 tons, and he sent 3, saying it was lying

at the station and the truck was required. . . . Two of my neighbours, whose names I am willing to produce, found the same difficulty in getting their stock to eat the cake, and this set me thinking. Had I used the R.A.S.E. forms, I should have been all right.

On July 10 Mr. Iles wrote to the Society's Chemist :—

When I showed Snowsell your verdict, he altogether scoffed at it, remarking that he had never believed in you, and that Professor Kinch was the *only reliable analyst*. Having such perfect faith in your verdict, and being willing to allow him to hang himself with his own rope, I sent a portion of the *same cake* to Professor Kinch, with the result that his figures correspond entirely with your own, and his foot-note is almost verbatim the same as yours.

Mr. Iles complained about the cake, and the following correspondence ensued :—

Alex. Iles, Jr., Esq., The Park Farm,
Fairford, Gloucestershire.

Hull: July 8, 1890.

DEAR SIR,—You have right to complain if you bought the cakes as best quality, and we have told Mr. Snowsell this, as you will see by the enclosed copies of letters we have written to him.

We are always pressing dealers to push the $\diamond$ Special 95 Per Cent., but many consumers will not give the price, hence we have to make second-class cake 30s. per ton under the highest in price and quality.

May we send you some of the $\diamond$ Special? You will then see the difference.

We trust that you will exonerate us from all blame; as the servants of the consumer we have to make what he requires, but we always recommend the highest quality. If you have been deceived it is not by us; and as you will see by the letters, we have frankly expressed our views, and that you ought to have been told that 30s. a ton is a GREAT difference in cakes at present values, and means a correspondingly GREAT difference in quality.—
Yours truly,

WALKER & SMITH, LIMITED.
per H. F. S.

COPY—LETTERS

From Walker and Smith, Oil Mills, Hull,
to Jas. Snowsell, Cirencester.

June 5, 1890.

DEAR SIR,—You know very well that our $\diamond$ Special 95 Per Cent. is 30s. dearer and 30s. better than the $\diamond$ and so does every dealer in our books.

To reduce 95 per cent. cakes 30s. a ton it stands to common sense that either rubbish must be put in the seed or admixture added. We prefer the latter, and if you have sold it as "Best," knowing that it is 30s. under the price and quality of our best quality, you are to blame, and we decline to have any blame put on us. We are making large quantities of this cake; it is of good value at the money, and those farmers who won't go to the price of *finest cake* cannot do better than buy $\diamond$.

We shall be glad to know whether we are to send the 4 tons ordered to Bourton; it will be our usual quality.—Yours truly,

pp. WALKER & SMITH.

H. F. SMITH.

June 7, 1890.

DEAR SIR,—If you get your friends on to our $\diamond$ Special, you'll never satisfy them with any other. We send the 4 tons forward, and will meet you in a reduction in the price at the end of the month. We could do no good by seeing Mr. Iles, and our telling him that he has been getting *cheap cakes* at a *cheap* price is no more than you can tell him. We strongly advise you to push specials, and let the farmer know that if he wants cheaper cake he can have it.—Yours truly, pp. WALKER & SMITH.

H. F. S.

June 11, 1890.

DEAR SIR,—Our Special 95 Per Cent. is the finest cake made, and it is getting us much credit, and gaining ground wherever it goes. We enclose one of numerous analyses; this one was sent by a customer from the bulk unknown to us.

We offer you 10 tons monthly, June–August, at 7l.

20 " " September–December, at 7l. 15s.

We made large contracts thereat, and since then forward linseed has considerably advanced. Hence this is a most favourable offer, and we want you to push and make a trade in Special.—Yours truly,

pp. W. & S., Ltd.

H. F. S.

June 14, 1890.

DEAR SIR,—We note yours of yesterday, and return Mr. Iles' letter respecting the cake. If he did not know that he was buying second-class cake at 30s. per ton under the price and quality of 95 Per Cent. he ought to have done, and you ought to have enlightened him if he did not know. But surely he cannot plead ignorance in these days.—Yours truly,

pp. W. & S., Ltd.

H. F. S.

June 17, 1890.

DEAR SIR,—We can add nothing to our previous notes. Both you and Mr. Iles knew, or ought to have known, that a difference of 30s. in the price of linseed-cake means 30s. difference in the quality.

You have done sadly wrong in not telling your friends that they were getting cake 30s. commoner than best cake; and how can we bear the blame that really is yours?—Yours truly,

pp. W. & S., Ltd.

H. F. S.

Notes, Communications, and Reviews.

THE REPORT OF THE SELECT COMMITTEE ON THE HOP INDUSTRY.

A SELECT COMMITTEE was appointed in the last session of Parliament, in consequence of the complaints and representations of many hop-planters, to inquire into the causes which have produced the steady decrease in the acreage of land under hop cultivation, and the serious displacement of labour occasioned thereby, and to report as to the best means, if any, of providing a remedy.

The Committee was strong, composed of practical men, several of whom represent hop-producing districts and have a considerable knowledge of the details of hop cultivation, and was presided over by the Rt. Hon. G. Shaw-Lefevre, who is well posted up in the subject. Every point was taken and duly weighed. The witnesses were well chosen, so that not only was the hop-planting interest directly and fully represented, but also collateral interests, as of brewers, hop-factors, and hop-merchants. Scientific, chemical, evidence also was given by distinguished chemists, mainly, however, upon the question of substitutes for hops alleged to be used by brewers.

It will be said by all who read the proceedings of this Committee that it was a careful and exhaustive investigation, though the conclusion arrived at is not satisfactory to the producers of hops, nor perhaps logically deducible from the main evidence given by them, which pointed unmistakably to Protection. Impartial persons stated their belief, when the appointment of this Select Committee was first announced, that nothing in the shape of relief to the hop-planters could possibly come from its proceedings. No Committee of the House of Commons, unless specially packed for the purpose, would deliberately recommend the imposition of a duty upon foreign hops; and this, in the opinion of the majority of the witnesses, is the only way in which relief could be afforded, though it is certain that in the course of a very few years the increase of the home acreage consequent upon a protective duty would again bring about over-production and low, unremunerative prices.

With regard to a duty upon foreign hops the Committee say:—

"The great majority of witnesses engaged in the cultivation of hops attribute the fall of price mainly, if not wholly, to foreign imports. They allege that the price of foreign hops rules the market for English hops, and that foreign hops have largely supplanted English hops in the home consumption. The greater number of these witnesses favour the imposition of a duty on foreign hops to the amount of 30s., or more, per cwt. By some it is suggested that this duty should be accompanied by a tax of 1l. per acre under cultivation of hops in England. This, however, was objected to by the great majority of witnesses. The proposal, therefore, is practically one for a protective duty on hops.

"Your Committee, while not excluding evidence in this direction, have not thought it necessary to take evidence as to the ultimate effect and incidence of such a protective duty upon the cultivators of hops and consumers of beer, or as to the expediency of taking a step with respect to a single article of production and consumption at variance with the general commercial and financial policy of the country. Your Committee cannot recommend the imposition of a duty upon foreign hops. They have not, however, refrained from considering how far the reduction of late years in the acreage of hops has been due to their free importation."

It is shown in this report that the effect of the foreign importations of hops is not nearly so great as it has been depicted. In spite of imported hops, the cultivation of English hops increased rapidly immediately after the duty upon foreign hops was taken off in 1862. In that year there were not 50,000 acres, but from this time there was almost a yearly increase up to 1878, when there were 71,789 acres of hop-land in England.

The Committee state that "the crop of hops is so uncertain, varying so much from year to year both in quantity and quality, that it is necessary to take averages of not less than seven years in order to form a fair estimate of results. Taking the last three periods of seven years, and estimating the average produce of hops at 7·8 cwt. per acre, the following table shows the average produce and import":—

Period	Average number of acres under cultivation	Average produce	Average import of foreign hops	Total annual consumption
		cwt.	cwt.	cwt.
1869-75	63,000	491,400	167,000	658,000
1876-82	68,000	531,900	195,000	726,000
1883-89	65,000	507,000	169,000	676,300

"The septennial period 1876-82 contained two years of exceptionally low produce, 1879 and 1882, and the average produce was probably somewhat below that stated; but even with this correction the table does not show that foreign hops have supplanted English hops of late years; on the contrary, the imports have borne about the same proportion to the home produce in

successive periods. In fact, since 1867, the import of foreign hops has been maintained at about one-fourth of the total consumption, increasing when the home crop has been small, and decreasing when there has been an abundant crop. Thus, in 1882, when there was almost a total failure in England, and when the price rose to a very high figure, the foreign imports reached the amount of 305,000 cwt., and in 1886, when there was a most abundant crop in England, the foreign supplies fell below 100,000 cwt."

Although it does not materially affect the conclusions of the Committee, it must be pointed out that their figures with regard to the imports of foreign hops are not quite correct. According to the returns of the Board of Trade the annual average quantity of hops imported from foreign countries during the last twenty-one years is close upon 190,000 cwt., instead of 177,000 cwt., as shown by the foregoing table.

In 1882, for example, the foreign imports were 319,620 cwt., and 153,759 cwt. were imported in 1886, as shown by the returns of the Board of Trade.

From the evidence given by brewers and hop-merchants, and from the statistics laid before the Committee, it is stated that foreign importation has not been the sole cause, nor even the main cause, of the depression in the hop industry.

The general depression of trade affected the demand for beer and the consumption of malt, and saccharine substitutes for malt, and hops. In 1878 the total quantity of sugar and malt used by brewers was equal to 8,020,955 quarters, while in 1883 only 7,016,922 quarters were consumed, and in 1886 only 7,058,495. Since trade has improved there has been an increase in the consumption of malt and sugar. As an instance of this improvement, 7,760,823 quarters of malt and sugar were required by the brewers in 1889.

Another reason for the diminution in the demand for hops is alleged by the Committee to be a considerable economy in the use of hops since 1882, when there was a hop famine, and prices were higher than they have ever been. In the words of the report:—

"The very high price of hops in 1882 induced brewers to turn their attention more closely to the subject, and science was brought in aid of the manufacture of beer. It was found possible by the use of ice to brew continuously through the year; the consumption of beer became more rapid; it was no longer necessary to keep large stocks of beer for many months; the taste of the public altered, a higher quality of beer less heavily hopped is now preferred. As a result of these changes the proportion of hops used to a quarter of malt has been reduced to an amount generally estimated at $1\frac{1}{2}$ lb. per quarter of malt, or 15 per cent. When there is added to this the reduction due to a reduced consumption of malt, estimated at 12 per cent., the two together account for a largely reduced demand, and consequently for a fall of prices; it was to be expected, therefore, that there would be a reduced cultivation

of hops corresponding to the increased cultivation in the decade prior to 1878."

The use of hop substitutes has for some years past been declared to be an important cause of the falling off in the demand for hops. It is alleged that in 1882, when hops were abnormally dear, large quantities of substitutes, as quassia, chiretta, colombo, gentian, were employed, and that since then the substitution of these drugs for hops has been extensively continued.

Most of the large brewers positively deny that they use substitutes for hops. It would be at the risk of losing the reputation of their beers, for it is well known by brewers' chemists that these drugs can only perform one of the functions of hops, namely, that of imparting a bitter flavour to beer. The other functions—of making the beer keep, of giving it an aroma, and of precipitating certain ingredients of the wort—cannot be performed by substitutes. This was affirmed positively by scientific witnesses.

In America there has been a great outcry regarding the employment of these drugs for hops, but the American Government evidently do not think they are abundantly employed, as they decline to prohibit their use, and the duty upon hops imported into the United States has been recently raised from 37s. 6d. to 70s. per cwt.

The Committee remark that "it is admitted generally that it is impossible to make beer such as the public require without hops, and that at most the drugs referred to can only be used as substitutes for a small proportion of the hops which would otherwise be used. It is alleged that none of the larger and better brewers make use of any of these substitutes."

They add: "Although the depression of the hop industry cannot be largely attributed to the use of such substitutes, the evidence submitted to the Committee is sufficient to show that their use is prejudicial to the interests of the growers in years when the crop of hops is deficient. The Committee therefore recommend that if used they should be declared."

This is the only recommendation made by the Committee. In the next session of Parliament a Bill will probably be brought in to make the use of hop substitutes illegal unless a declaration of their use is made. But in the meantime the chemists must improve their processes of detecting these substitutes, as from the evidence adduced it appears that they can only affirm that hops have not been employed, but they are unable to specify the exact substitute that may have been used. And this would hardly be sufficient in case of a prosecution.

One reason alleged in support of the extensive use of substitutes for hops was that in 1882 their price rose so considerably. It must, however, be remembered that in that year quassia, whose price is said to have risen from 5*l.* to 40*l.* per ton, was first extensively used for syringing the hop plants to clear them of aphid blight. In more recent years the price of quassia has doubled, or trebled, in a few weeks, in consequence of the great demand for syringing, or washing, hop plants. Other bittering substances have naturally advanced in value with quassia.

Several witnesses who were called before the Committee expressed a strong opinion that all foreign hops imported should be required to be marked with the name of the grower, and the parish, or district, in which they were grown. This would principally be useful to brewers and would protect them from the risk of buying inferior brands for those of better quality, as Baden hops for best Bavarians, for example. But this would hardly benefit the English grower, except that if marking foreign hops were insisted upon it might reduce the amount of hops imported from Germany, where, in many cases, hops are not packed by the grower, but by merchants, who buy them half dried, and complete the process of desiccation and pack them for sale. As to this, the Committee "are unable to see that the interest of English hop-growers can be promoted by requiring any certificate of origin of such foreign hops, and thus giving greater security to purchasers of them."

The general conclusion of the Committee is that "the evidence has been to the effect that, while for several past years the price of hops has been unprofitably low, especially in the case of inferior qualities, yet the year 1889 has been an exception, and that the growers in many districts have done fairly well. As the crop in that year was somewhat above the average, there is reason to hope that, with a reduced acreage under cultivation and an increased consumption of malt, the balance between supply and demand is being redressed to the advantage of the producer, and that more prosperous times may be at hand."

This is true in the main, but the statement that the growers in many districts did fairly well in 1889 must be modified. If the growers had been able to supply the market gradually they would have done well, but many of them sold their growths in September and October, according to the pernicious custom of the hop trade, at the current rates, kept low by the large temporary supply, which were from 40 to 60 per cent. less than those holding after the Christmas holidays. This custom of selling the whole of the year's growth of hops in a few weeks to middlemen—merchants—was not prominently brought under the notice of the Committee, nor is it adverted to in their report, though it tends in an important degree to decrease the price of hops to the growers.

The more "prosperous times" prophesied have already arrived for some enterprising growers who have produced hops this year in spite of blight and mould. Those whose hops have been blighted or mildewed, on the other hand, will lose much money. Prices for hops will be high, as the crop throughout the world will be much under the average, and the prospects for the next year or two are bright in consequence of diminished supply, and larger consumption caused by the improvement of trade generally. But after this the deluge, if one may judge from the experiences of former times. Planting in unsuitable places will follow after the high prices. Growers will plant beyond their capital. Inferior and heavy cropping sorts will be selected for cultivation, and a Select Committee will again be invoked.

CHARLES WHITEHEAD.

THE MURCHLAND MILKING MACHINE.

MANY efforts have been directed to the production of an efficient milking machine, but not one of the appliances that have been devised has come to a successful issue. That which is about to be described goes on the lines of others, which at one time and another have been protected by patent, in so far as the aid of a vacuum, for causing the flow of milk, is brought into play, but in the simple and easy way of distributing the motive power, and in the handy method of its application, the apparatus now under notice is at once distinguished from its predecessors.

The inventor, Mr. William Murchland, is a sanitary engineer in Kilmarnock, Ayrshire, and until last autumn knew little about cows, whilst now he is better versed in the milk-yielding capacity of cows than the majority of those who own them. He has been placed at considerable disadvantage in the prosecution of his experiments. The farm steading at which they were initiated, and are still being carried out, is nearly three miles from Kilmarnock, and either Mr. Murchland or one of his assistants has been obliged to attend morning and evening in order to superintend the daily milking operations. The farm, Haining Mains by name, is on the Duke of Portland's estate, and is occupied by Mr. David Shaw. From the commencement, Mr. Murchland has had to contend against the hostility of the girls employed to milk the cows. And even when a fair start was made, he had to face the difficulty of having no data whatever with which to compare the results of his machine. No milk register had been kept at the place, nor could one be met with throughout the district—and this in the centre of the dairying industry in Scotland.

Before referring to the results obtained, it may be well to first describe the machine, the most striking feature of which is its simplicity. An iron pipe (*a*, figs. 1 and 2), one inch in diameter, is carried round the cow house, in a vertical line with the shoulders of the animals, and sufficiently high to be out of harm's way. It communicates with a hand-pump (*b*, figs. 1 and 2), which is attached for the purpose of withdrawing the air from the pipe and forming a vacuum. The circular tank (*c*, figs. 1 and 2) communicates with a well (*d*), full of water, and its object is to serve as a regulator of the vacuum. From the iron pipe (*a*) project small connections (*e*, figs. 1 and 2), one opposite the space between every pair of animals, each connection being provided with a stop-cock. To one of these connections is fitted a length of india-rubber tubing, the other end of which is attached to the special milk pail (*f*, fig. 1). The pail, as will be noticed from figs. 3 and 4, is cylindrical in form, with a conical top minus the apex. Its opening, which is about 4 inches in diameter, is closed by means of a thick glass disc, which sits inside flush with the outer rim of the pail, resting on a thick rubber band, held in place by a projecting ledge of brass underneath. On one side of the neck of the pail is a connection (*g*, figs. 3 and 4), similar to that on the

pipe above, but without the stop-cock ; and, opposite to it, on the other side, are four connections of the same sort (*b*, figs. 3 and 4). The single

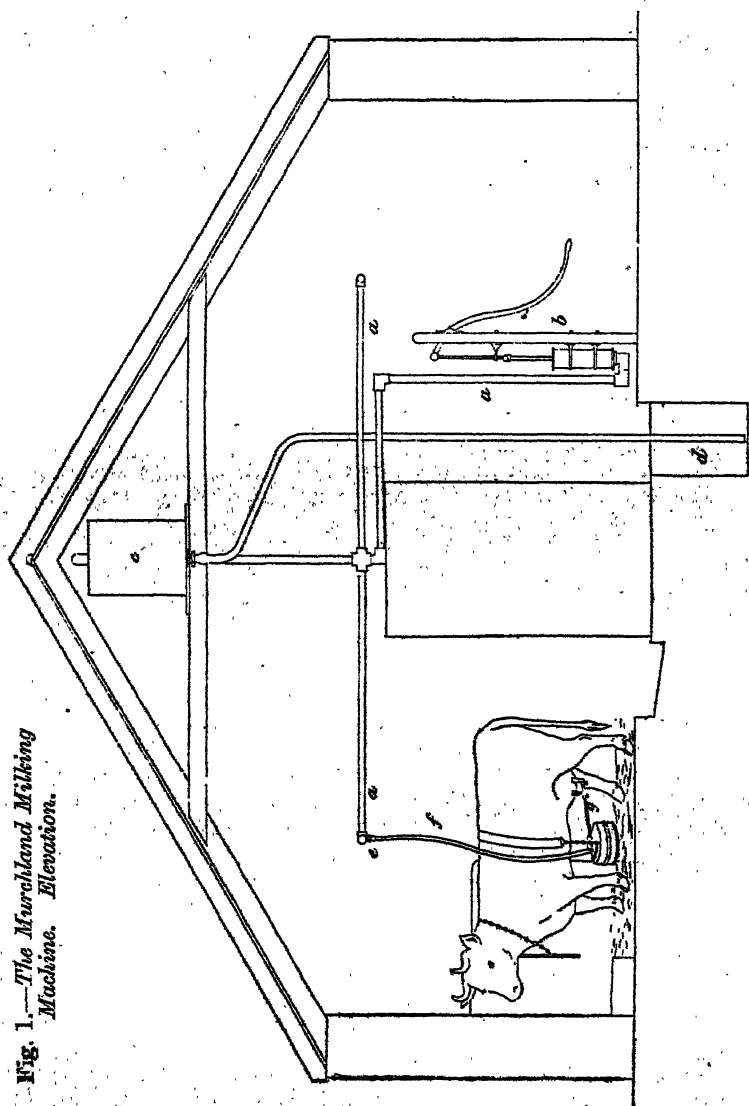
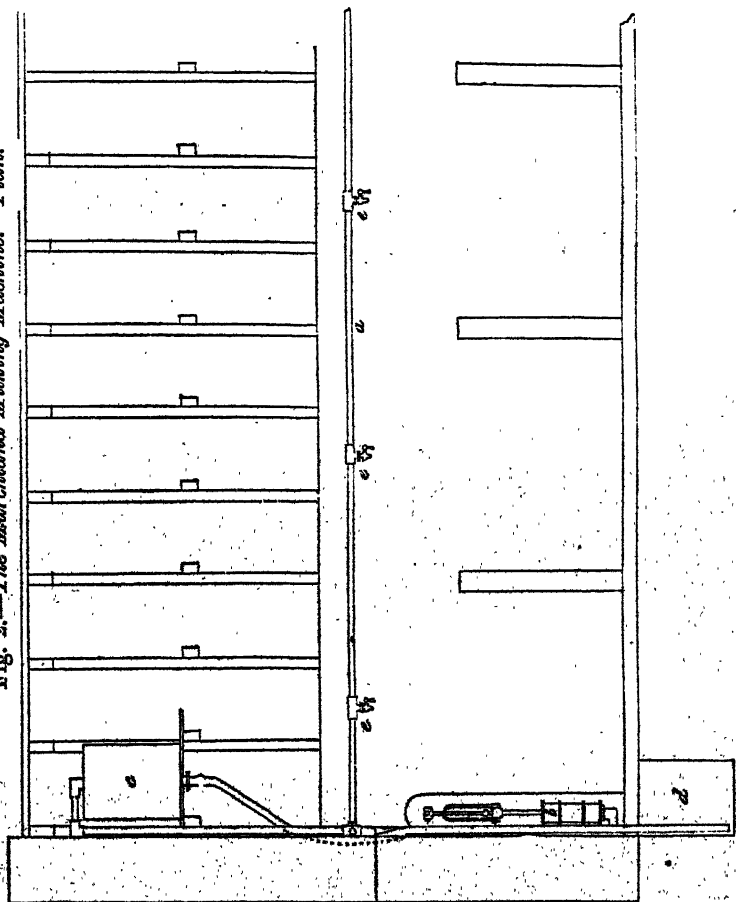


Fig. 1.—*The Murchland Milking Machine. Elevation.*

one *a*, is for the purpose of attaching the elastic tube to the pail, and so connecting the latter with the overhead pipe ; and the other four are for shorter lengths of tubing (*g*, fig. 1), connected in their

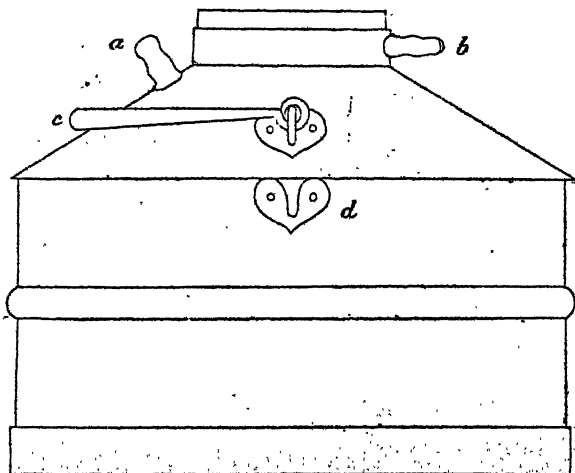
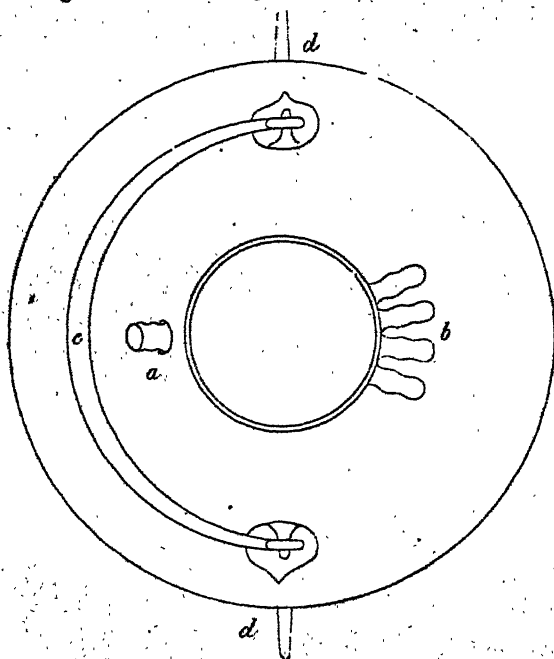
turn with the little teat-cups (fig. 5), provided for holding the teats of the animal to be milked. The cups are made of tinned iron. The short stem shown on the side view is provided with a stop-cock, and is fitted for attachment to elastic tubing. The pail, besides its handle (*c*, figs. 3 and 4), is fitted with two hooks (*d*, figs. 3 and 4), by means of which it is suspended a little in front of the animal's udder

Fig. 2.—The Murchland Milking Machine. Plan.



—see fig. 1—a broad band of girthing, with several links at either end (to allow of the adjustment of the proper position of the pail), being laid over the animal's loins for the purpose.

When all is ready for a start the pump is worked, and the air is thus exhausted from the pipe. Then a pail is adjusted under the cow, the long tube is attached to a connection overhead, the

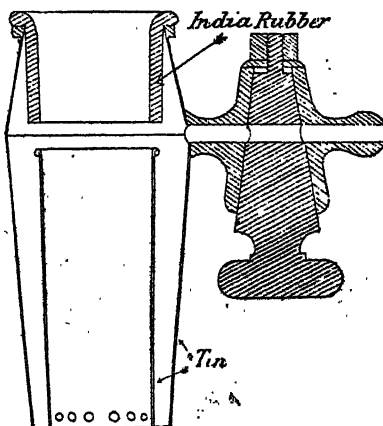
Fig. 3.—*The Milking Pail. Side View.*Fig. 4.—*The Milking Pail. Plan of the Top.*

stop-cock is opened, and the pail at once forms a vacuum. Next, one of the teat-cups is moistened and placed so as to embrace a teat; the stop-cock of the former is opened, so that the teat is brought in contact with the vacuum, and the milk at once begins to flow. When all four of the cups have been adjusted, and each is connected with the vacuum, four tiny jets of milk can be seen playing into the can immediately beneath the glass lid or stopper. The jets deliver the milk in streams, that seem to pulsate in accordance with the action of the animal's body. From 8 to 10 minutes serve to exhaust the milk stored up in the udder.

An animal operated on by the machine seems to suffer no inconvenience, and to be quite unconscious that she is being deprived of her milk in an unorthodox fashion. The apparatus causes no pain, though it is rather amusing to watch the astonishment of some fractious old cow when first brought under the influence of the machine. Her alert air, shown in the erect head, stiffened ears, and distended eyes, indicates that she is aware of something unusual going on, but what or whereabouts she is not exactly sure until the apparatus has been at work for some time. After a little fidgeting, however, and an occasional kick out, she soon recovers her equanimity, and settles down, as though nothing were the matter, to busy herself with what is to be had in the manger. And a newly calved heifer, once the apparatus has been adjusted on her and set going, makes as little to do over the affair. Indeed, the apparatus promises to save to milk-yielding animals much distress which, under existing circumstances, it is difficult to avoid causing. Its use will obviate the excruciating pain that animals with swollen or chapped teats have to suffer when being milked by hand. And certainly its employment insures much greater cleanliness in the operation of milking than can usually be attained by using the hand. Those familiar with milking as carried out on a large scale, and under the conditions incidental to ordinary homesteads, know what this means. The several pairs of hands which feed and clean the cows and remove their litter have to take their turn in milking, and usually with too scant opportunity—and this little not always taken advantage of—for removing the effects of the one operation before beginning the other.

In the south-west of Scotland there is in most parts a very decided scarcity of good milkers. At farms, where from 40 to 100

Fig. 5.—The Teat-cup. Section.



cows are kept, there is frequently great difficulty experienced in mustering a sufficiency of hands for the work. A farm-servant, possessed of a wife who can milk, is picked up for service long before another who is not so fortunate (from the dairy-farmer's view) in this respect; and one possessed of daughters who also can help in the operation is able to dispose of his services at a premium. Hence it happens that nearly every dairy-farmer of any importance is anxiously on the outlook for an efficient milking machine, and the appearance of a simple and workable apparatus, once the ice has been broken by one or two adventurous spirits having it put in operation, will be warmly welcomed. As the diagrams show, there is not much in the apparatus here described to make the initial cost at all prohibitive. The fixings are of ordinary material and can be adapted to any sort of building, and they are not likely to get out of order or to need renewal for many years. The pails with their accessories form the most expensive item, and it is the number of these that determines the number of cows which can be milked simultaneously. With a pail for each cow in the building, and a similar number of connections on the overhead pipe, the whole of the animals could be milked in the same time as an individual cow. A boy is competent to maintain the necessary vacuum for the milking, either of one, or of the whole lot at once. Three girls can easily manage to keep half-a-dozen or nine pails going; and in this way a large number of animals can be quickly dealt with.

The principle of the machine, as has already been said, is no new one. Numerous milking machines on the same initial lines as Mr. Murchland's have been constructed, and one or two have been patented, but with no useful, practical result. They are either too complicated, or too cumbersome, to be easily manipulated. Where Mr. Murchland's is superior to those which have gone before is in the availableness of the motive power at any part of the cow-house, wherever the pipe can be led—straight on, round a corner, or even into another building. With the other forms of apparatus it would appear that the attention of the pump is confined to one cow at a time, whereas in this case the action of a single pump is sufficient for all the animals which have to be milked, for one or all can be brought under the influence of the vacuum at the same time.

The machine attempts nothing in the way of pulling and squeezing the teats similar to hand-milking, or occasionally thrusting against or tossing up the udder in imitation of the sucking calf, as some of the former machines have done, but trusts entirely to the pressure of the atmosphere for emptying the udder. The calf when sucking forms a vacuum by drawing its tongue down from the roof of its mouth, the closed lips in front and the false palate behind preventing air from entering. The teat thus surrounded by a vacuum communicates the lowered pressure to the contents of the udder. The outside pressure on the udder being greater than the inner, its contents are consequently forced out. When the free space in the animal's mouth is filled it presses up the middle of its tongue, still keeping the lips closed, which action forces aside the soft palate and

carries the contents of the mouth into the gullet, at the same time breaking up the vacuum and stopping the flow of milk. Thus, while in the case of the natural method of extracting the milk the vacuum is suspended every time the animal swallows, with Mr. Murchland's machine the action of the vacuum is maintained all through the operation, and from 8 to 10 minutes serve with the majority of the animals to empty the udder of its contents. The sucking-calf pulls but little at the teat, so that on the whole the apparatus here described approaches closely to Nature in the way the latter provides for the young animal to abstract milk from its dam.

At the outset of the trials of the apparatus, in February, when calving was beginning, Mr. Murchland operated on the cows just as they came to hand. It soon became evident that the machine was effective for the purpose for which it had been introduced, and notes began to be taken of the milk yielded by the different animals under treatment. The cows continued to improve in their yield—at least, none fell off in this respect; but there were no means of instituting a comparison between machine-milked and hand-milked animals. It was, therefore, arranged that out of the next twelve cows which were to calve, six were to be milked entirely by means of the machine, and six by hand, a register being kept of the yield of each animal morning and evening. After a while, however, some mischances happened to one or two of the selected six that were hand-milked, and the results of the machine-milked six came to be pitted against the returns of the full herd, a register of the yield of each animal having now been begun. For a period of three weeks, 18 cows which were hand-milked gave an average daily yield of 24½ lb. each; and the six which were machine-milked, an average of 24½ lb. And, during another period lasting two weeks, the 18 gave a daily average of 24½ lb. and the six an average of 24½ lb. From this date forward a good deal of cross-working took place, in the way of hand-milking the animals which had been machine-milked, and *vice versa*, thus breaking up the continuity of comparison. By-and-by some little friction made itself apparent between the machine-operators and the girls in charge of the cows, and again Mr. Murchland confined his attention to the original six animals. But now he set himself to discover the right degree of vacuum his machine ought to be worked at, and what sort of teat-cup it would be best to adopt; and this work likewise put aside the possibility of comparison between the differently treated animals. The vacuum used at first, equivalent to a pressure of eleven inches of mercury, would appear to be the most suitable.

Mr. Murchland now inclines to use a teat-cup so formed as to surround the teat with milk, in this way following up Nature again, and so preventing the possibility of injury to the teat by bringing it in contact with a metal surface as originally done. This he accomplishes by inserting a diaphragm within the teat-cup, the lower part of which is of tin and perforated, and the upper part, which grips the root or neck of the teat, being made of indiarubber (see fig. 5), or the diaphragm may be wholly of rubber. The

inventor is working out other modifications of the various parts of the machine, such as in situations where the milk can be run to a building below the level of the cow-house, making the weight of the milk maintain the vacuum, and so on; but it is not necessary to describe these. The diagrams, together with this short description, indicate the main features of this new milking machine, which only requires to be seen in operation to demonstrate to practical men its feasibility.

RICHD. HENDERSON.

GOOD TENANTABLE REPAIR.

A COVENANT by the tenant to keep the house in "good tenantable repair" being almost as common in leases or agreements for tenancies of farms as in leases or agreements for tenancies of ordinary dwelling-houses, a note of the following case,* in which the Court of Appeal laid down a clear definition of these words, which are often so puzzling as well to the practitioner as to the landlord and tenant whose interests are directly affected by them, will, it is considered, be not out of place in the Journal, although the case referred to an ordinary suburban residence and not to a farmhouse.

The house and premises in question were let by the plaintiff to the defendant under an agreement in writing by which the defendant (amongst other things) agreed that he would "during the term keep the premises in good tenantable repair, and so leave the same at the expiration thereof." The tenancy having expired, the plaintiff, the landlord, brought an action against the defendant, the tenant, to recover damages for the breach of the foregoing agreement. It is unnecessary to set out in detail the various steps in the action—suffice it to say that the Official Referee, to whom the action was in the first instance referred, awarded damages in respect of the cost incurred by the landlord in re-papering the walls of rooms where the paper which was upon them when the tenancy commenced had become worn out, in re-painting the internal woodwork where the paint had worn off, in whitewashing and cleaning the staircases and ceilings, and in replacing with a new floor the kitchen floor which had existed when the tenancy commenced. From this award the tenant appealed to the Queen's Bench Division of the High Court, who decided that the award was wrong, and remitted the case to the Official Referee. The landlord then appealed from that decision to the Court of Appeal, and the Judges of the Court of Appeal before whom the case was heard (Lord Esher and Lord Justice Lopes), in deciding that the case ought to be remitted to the Official Referee, defined the words "good tenantable repair" in such a way as to be a guide to the meaning of that expression, not only in the

* Proudfoot v. Hart, reported in the Law Reports, 25 Q.B.D., 42.

particular case before them, but generally. Said Lord Esher : "Lord Justice Lopes has drawn up a definition of the term with which I entirely agree. It is this : 'Good tenantable repair is such repair as, having regard to the age, character, and locality of the house, would make it reasonably fit for the occupation of a reasonably-minded tenant of the class who would be likely to take it.' The age of the house must be taken into account, because nobody could reasonably expect that a house 200 years old should be in the same condition of repair as a house lately built ; the character of the house must be taken into account, because the same class of repairs as would be necessary to a palace would be wholly unnecessary to a cottage ; and the locality of the house must be taken into account, because the state of repair necessary for a house in Grosvenor Square would be wholly different from the state of repair necessary for a house in Spitalfields. The house need not be put into the same condition as when the tenant took it ; it need not be put into perfect repair ; it need only be put into such a state of repair as renders it reasonably fit for the occupation of a reasonably-minded tenant of the class who would be likely to take it."

S. B. L. DRUCE.

THISTLE SEEDS.

WHEN we see a field full of thistles seeding, and the seeds blown by the wind over the neighbouring fields, we are apt to say, "What a nuisance to the neighbourhood these thistles are ; the man who lets them grow to such an extent ought to be made answerable to his neighbours for the loss he causes them through his neglect." But the law unfortunately gives the man's neighbours no such remedy, as has very recently been decided in the case of *Giles v. Walker*.* The plaintiff and the defendant occupied adjoining fields. The defendant's field had formerly been forest land, but for some years prior to 1883, when the defendant's occupation of it commenced, it had been brought into cultivation by its then owner. It was stated that the forest land prior to cultivation did not bear thistles ; but that when it was cultivated they sprang up all over it. The defendant neglected to mow the thistles, or in any other way prevent them from seeding, and in 1887 and 1888 there were thousands of thistles on his land in full seed. These seeds were blown by the wind on to the plaintiff's adjoining field, where they took root and did damage. The plaintiff sued the defendant for such damage in the Leicester County Court. The judge of that court left to the jury the question whether the defendant in not cutting the thistles had been guilty of negligence, and the jury found that he had, whereupon the judge entered judgment for the plaintiff. The defendant appealed. Upon the hearing of

* Reported in the Law Reports, 24 Q.B.D., p. 656.

the appeal the Court stopped the Counsel for the defendant so soon as he had stated the facts of the case, and called upon the Counsel for the plaintiff to substantiate the judgment. He contended that if the defendant's predecessor had not brought the land into cultivation, the thistles would not have grown, and the nuisance would not have been created, and that the defendant, by entering into occupation of the land with the nuisance upon it, was under a duty to prevent damage from thereby accruing to his neighbours. The Court, however, which consisted of Lords Coleridge and Esher, made short work of the argument, and in a very few words allowed the appeal. "I never heard of such an action," said Lord Coleridge; "there can be no duty as between adjoining occupiers to cut the thistles, which are the natural growth of the soil."

S. B. L. DRUCE.

THE PRICE OF IMPORTED GRAIN.

It might be not unreasonably maintained that the price of grain—whether home-grown or imported—is a subject in which the British farmer is year by year becoming less interested. There are, no doubt, those who believe that the growth of—at any rate—wheat for sale will soon die out almost completely, and that the cultivation of corn-crops, so far as it exists at all, will be carried on chiefly for stock-feeding. That time, however, has not yet quite arrived, and while we grow, as we did last year in Great Britain, about 32 million quarters of cereals (wheat, barley, and oats), the market price of grain will not altogether lose its interest or importance.

It is scarcely necessary to observe that the published average prices of English grain are not looked upon by farmers generally with that respect which all right-minded persons would naturally desire to pay to official figures. The reasons for their mistrust are various. The chief is that the officially collected returns do not represent altogether the sale of more than a fourth of the year's crop. For instance, in 1889, the total yield in England and Wales, and the quantity accounted for at the returning markets, were, in round numbers, as follows:—

	WHEAT qrs.	BARLEY qrs.	OATS qrs.
Total yield	8,876,000	7,448,000	9,532,000
Quantity returned at markets	2,945,000	3,329,000	415,000

It will be seen, therefore, that while the total produce was nearly 26 million quarters, the average price was taken from the sale of $6\frac{1}{2}$ million quarters, or about one-fourth of the whole crop. As a matter of fact the case is really worse than these figures represent. It is admitted that the returns from the markets include a certain, and possibly a large, percentage of re-sales, so that the actual quantity of corn accounted for—if that which appears more than once in the figures be deducted—is to some unknown extent

TABLE showing the quantity and average value per quarter of Wheat, Barley, and Oats imported from each country during the year 1889, together with the official average prices per quarter of English grain in the same year.

COUNTRY	WHEAT		BARLEY		OATS	
	Quantity cwt.	Price per qr.	Quantity cwt.	Price per qr.	Quantity cwt.	Price per qr.
¹ England and Wales	12,614,248	s. d. 29 9	11,892,196	s. d. 25 10	1,158,252	s. d. 17 9
Russia	21,310,304	31 10	7,853,500	16 4	13,966,926	15 1
Sweden	—	—	64,717	26 10	1,568,167	16 0
Denmark	83,183	31 2	537,883	27 1	1,800	15 1
Norway	—	—	—	—	2,327	16 6
Germany	2,537,990	33 3	1,008,102	27 5	106,952	15 7
Holland	—	—	64,825	28 3	184,791	17 10
France	126,440	30 10	611,597	26 10	1,925	17 5
Spain	—	—	8,885	22 9	—	—
Austria	463,948	37 6	307,237	28 0	—	—
Bulgaria	634,453	28 0	74,114	18 1	—	—
Roumania	2,825,292	32 3	3,013,457	18 11	—	—
Turkey	668,276	29 9	1,899,700	20 5	—	—
Egypt	325,757	26 11	272,171	21 7	—	—
Algeria	—	—	190,228	22 9	—	—
Persia	150,407	31 2	—	—	—	—
United States	17,009,086	34 0	388,636	28 10	148,946	16 0
Chile	572,933	33 7	297,051	24 2	—	—
Argentine Republic . .	37,792	30 9	—	—	—	—
Other Foreign Countries } 	11,119	29 9	154,335	21 3	4,795	16 0
Total Quantity and } Average Price: } Foreign Countries }	46,756,950	32 7	17,318,468	19 10	15,986,129	15 4
British East Indies:						
Bombay and Scinde . .	7,572,987	31 6	—	—	—	—
Bengal	1,645,217	31 2	—	—	—	—
Australasia:						
South Australia . . .	462,067	38 11	—	—	—	—
Victoria	279,842	37 11	—	—	—	—
New Zealand	664,151	35 5	—	—	—	—
Brit. N. America . . .	1,170,650	34 0	—	—	4,067	16 3
Other British Possessions } 	23	33 3	—	—	371	25 2
Total Quantity and } Average Price: } British Possessions }	11,794,937	32 3	52,442	30 7	4,438	16 11
Total Quantity and } General Average } price for Imported } Grain }	58,551,887	32 7	17,400,910	19 10	15,990,567	15 4

¹ The quantities returned at the English statute markets have been reduced from the "quarters" of the official return to hundredweights for the purpose of more ready comparison with the imports.

less than $6\frac{1}{2}$ million quarters, and consequently probably a less proportion of the total crop than even one-fourth.

In the case of imported grain no such difficulties occur. We know precisely both its quantity and its value, since they are faithfully recorded by the Custom House authorities, and duly published in the "Annual Statement of the Trade of the United Kingdom." From these figures the statement on page 655 has been worked out.

The most remarkable fact in the figures recorded is to be found in the case of wheat. Probably very few persons would be prepared for the statement that the total quantity of imported wheat was worth on an average 2s. 10d. per quarter more than home-grown wheat. It would be admitted that wheat from certain countries—such as Australia and California, for instance—makes more money than English, but it would be thought that the general bulk sold for less. The figures show that not only is the average for foreign countries and British Possessions—whether alone or together—considerably higher than the official average for England and Wales, but that the average value of the wheat imported from every country separately distinguished—with the exception only of Bulgaria and Egypt—equals or exceeds the average of home-grown wheat. These two countries send between them only 961,000 cwt. out of a total of imported wheat of $58\frac{1}{2}$ million cwt., so that it may be said that practically the whole of the wheat sent to this country makes a higher average price than that grown at home.

In the case of barley the consignments from eight different countries made a higher average price than that of home-grown produce, but they only accounted altogether for some $3\frac{1}{2}$ million cwt. out of a total of $17\frac{1}{2}$ million cwt. imported. Consequently the large quantity sent from Russia, Roumania, Turkey, &c., at a low value, brought down the average value of foreign barley to 6s. per quarter below the official average price for home-grown barley.

A result similar in kind though not in degree is shown in the case of oats, the price of the imported grain being brought down by the great bulk—about seven-eighths of the whole—of low-priced Russian produce. Thus the average for foreign oats is 2s. 5d. per quarter below that officially quoted for English oats.

The general tendency of these figures is to show that to an extent much larger probably than is commonly supposed, the British farmer is being beaten in the matter of quality—or at any rate of adaptability to market, which is practically the same thing. Prices for wheat, at their best, are bad enough nowadays, but it seems that it is the foreigner who gets them at their best, while the British farmer has to put up with something less. This is surely a fact deserving careful consideration.

R. HENRY REW.

THE AGRICULTURAL STATISTICS OF THE UNITED STATES.

THE Department of Agriculture at Washington has, for the first time, issued an *Album of Agricultural Statistics of the United States*. It includes sixteen maps of the United States, variously coloured and shaded, in order to afford a "clear and instant appreciation of some of the leading facts of American agriculture." English farmers cannot fail to be interested in the agricultural capabilities of their great Transatlantic competitor, and the skeleton map of the United States which is presented herewith (page 659) is intended to facilitate the comprehension of the following details, which have been gathered from a study of the charts in the Album. As some of the American figures are very large, the subjoined facts are given to afford a convenient standard of comparison :—

ENGLAND AND WALES.

	Acres		
Total area of land and water			37,319,221
Cereal crops, 1889 (acres)	Wheat	Barley	Oats
	2,389,968	1,898,062	1,872,989
Tenure of Cultivated Land, 1889:—			
No. of occupiers who <i>rent</i> land		405,859	82·4
" " " <i>own</i> "		66,385	13·5
" " " <i>rent and own land</i>		20,143	4·1
Total		492,387	100·0
Acresage rented and occupied		23,618,406	84·8
" owned and occupied		4,226,526	15·2
Total		27,844,932	100·0

It should be noted that barley is not a leading cereal crop in the United States. As a matter of fact, maize, wheat, and oats together make up as much as 97 per cent. of the total cereal production.

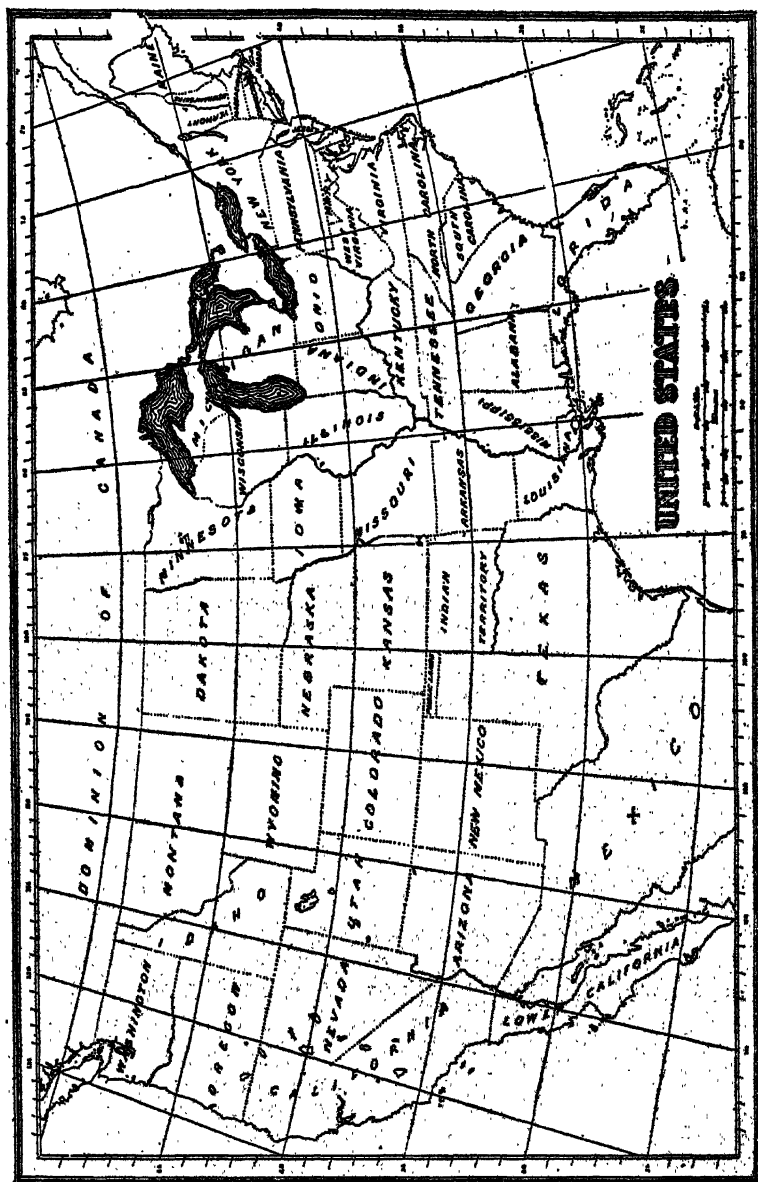
Apportionment of Area.—The whole area of the United States is thus apportioned :—Lands not in farms, 71·1 per cent. ; productive lands, 15·3 ; woodlands, 10·3 ; unproductive farm-area, 3·3 per cent. Lands not in farms reach their highest State percentage (99·8) in Arizona and Wyoming, their lowest (6·0) in Ohio. Productive lands are at a maximum (69·3 p. c.) in Ohio, and at a minimum (0·1) in Arizona and Wyoming. Woodlands range from 44·6 p. c. in North Carolina, to *nil* in Arizona, Idaho, Montana, Nevada, Utah, and Wyoming. The unproductive farm-area is as high as 18·5 p. c. in Kansas, and as low as 0·1 p. c. in Arizona, Montana, and Wyoming. West of the Missouri, lands not yet taken for farms almost exclusively prevail. They are very largely represented in the south, whilst in the eastern and middle States they occupy a much larger portion of the surface than in the Ohio Valley.

Farm Area.—The total area in farms comprises 41·6 p. c. under tillage, 11·5 p. c. in grass-lands, 35·5 p. c. in woodland, and 11·4 p. c. unproductive. The tillage-area attains its highest percentage (65·6) in Illinois, its lowest (19·4) in Wyoming. Grass-lands are at their maximum (39 p. c.) in Vermont, and at their minimum (1·3 p. c.) in Alabama and Arkansas. Woodland ranges from 66·3 p. c. in Florida to 0·3 p. c. in Utah. The unproductive area reaches 67·6 in Dakota, and only 1·9 p. c. in Vermont.

Farm Tenures.—The total number of farms is 4,008,907, of which 74·5 per cent. are cultivated by the owners, 8 per cent. by tenants paying a money rental, and the remaining 17·5 per cent. by tenants paying a share of the produce. The States in which more than 90 per cent. of the farms are cultivated by the owners are—Wyoming, 97·1 per cent.; Dakota, 96·1; Maine, 95·7; Utah, 95·4; Idaho, 95·3; Montana, 94·7; Washington, 92·8; New Hampshire, 91·9; New Mexico, 91·9; Massachusetts, 91·8; Minnesota, 90·9; Wisconsin, 90·9; Nevada, 90·3. The lowest percentage (49·7) is in South Carolina. The money-rental system varies between 23·4 per cent. of the farms in South Carolina and 0·4 p. c. in Dakota and New Mexico. Farms rented by tenants who pay a stipulated share of the produce range from 36·6 per cent. in Delaware to 1·8 p. c. in Maine and Wyoming. As a matter of fact, the share-tenants are to be found chiefly in the cotton States of the South and East. It appears that the freedman-occupants are generally tenants in name only, with a pretence of independent occupancy, living, not on separate farms, but on temporary subdivisions of land, without any substantial appurtenances of a farm, and without the capital necessary to equip a man as a working farmer.

Value of Lands.—The average value of lands throughout the States is 4*l.* per acre. In nine States the average exceeds this by upwards of 70 per cent.:—Rhode Island, Massachusetts, Connecticut, New Jersey, Delaware, New York, Pennsylvania, Ohio, Michigan; of these New Jersey is highest (13*l.* 1*s.* per acre), and Delaware lowest (7*l.*). On the other hand, four States, all in the South, fall more than 70 per cent. below the average:—South Carolina, 1*l.* 1*s.* per acre; Texas, 19*s.*; Georgia, 18*s.*; and Alabama, 17*s.*

Maize.—This is the most generally cultivated crop, and is grown in forty-one States; it occupies the largest area, and produces the greatest value of any crop in arable culture. The total area in maize, according to the Returns of 1888, is 75,672,763 acres, representing 41 per 1,000 acres of the entire land surface, and equivalent to more than twice the area of England and Wales. Maize is most largely cultivated in Delaware, Maryland, and the compact group of eight States comprising Ohio, Indiana, Illinois, Iowa, Kansas, Missouri, Kentucky, and Tennessee, all of which grow more than 100 acres per 1,000 of total area. The premier position is taken by Iowa, with 219 acres per 1,000; whilst of the States named, Ohio is lowest, with 110 acres of maize per 1,000. In the group of eight States mentioned,



nearly two-thirds of the whole maize product of the United States is raised. Maize is very little grown in Wyoming, Montana, Idaho, Nevada, and Arizona. The largest area of maize in any one State is 7,788,790 acres in Illinois; the smallest area of any significance is 6,100 acres in Washington.

The average yield in the United States for the ten years ending 1888 was 24·2 bushels per acre. The seven States which recorded the highest annual average yield during this decade were—Vermont, 34·3 bushels; New Hampshire, 34·1; Maine, 33·9; Nebraska, 32·7; Massachusetts, 32·1; Ohio, 31·7; and Pennsylvania, 31·7. The lowest annual average yield is in South Carolina (9 bushels per acre). Though the South has a large area in maize, and a very rich soil, its climate is more favourable to growth of stalk than to heavy yields of grain.

Wheat.—The total area, as given in the Returns of 1888, is 37,336,138 acres, representing 20 per 1,000 acres of the entire land surface, and practically identical with the entire area of England and Wales. Wheat is most largely cultivated in Delaware, Maryland, and the five States of the "wheat-belt"—Ohio, Indiana, Illinois, Iowa, Minnesota; all these grow more than 60 acres per 1,000. The premier position belongs to Indiana, with 121 acres per 1,000; whilst of the States named, Minnesota is lowest, with 61 per 1,000. Wheat is scarcely grown in Wyoming, Louisiana, and Florida. Ohio, Indiana, and Illinois, in the Ohio Valley, and Delaware and Maryland, produce almost exclusively winter wheat; whilst Minnesota and Iowa yield spring wheat. The spring-wheat region includes the country west of Lake Michigan and north of Missouri and Kansas, the Rocky Mountain plateaux, and a strip in New York and New England bordering on Canada.

The average yield over the whole country for the decade ending 1888 was 12·3 bushels per acre. As many as 11 States have an average yield which is more than 30 per cent. above the general average. These are—Colorado, 19·6 bushels per acre; Wyoming, 18; Montana, 17·8; Nevada, 17·8; Utah, 17·8; Idaho, 17·1; Washington, 16·7; Oregon, 16·6 (all in the Rocky Mountains region); and Massachusetts, 16·9; Connecticut, 16·7; and Vermont, 16·7 (all in New England). In the Western States, the high rate of yield is due to a virgin soil; in New England, to cultivation and condition of soil; but all these States together yield a comparatively small portion of the total wheat product. The lowest average yield is in Florida (4·7 bushels per acre).

Oats.—The total area recorded in the Returns of 1888 is 26,998,282 acres, equivalent to 15 per 1,000 acres of total land surface, and representing 72 per cent. (nearly three-fourths) of the entire area of England and Wales. In only two States does the area occupied amount to more than 60 acres per 1,000, Illinois recording 107 per 1,000, and Iowa 72. In seven other States the area ranges between 31 and 60 per 1,000 acres—New York,

Pennsylvania, Ohio, Indiana, Wisconsin, Missouri, and Kansas. The denser distribution in the Northern States is due to the fact that the oat crop requires a relatively low temperature. Gradual deterioration in yield and quality attends the cultivation of oats in all parts of the States. Oats of 40 to 50 lb. per bushel in Scotland, or Norway, or Denmark, usually yield lighter grain, even with the first crop, in the States, and the weight per bushel declines annually. In the South, good crops are got by autumn sowing for winter growth. Oats are not cultivated in Arizona. The largest area of oats in any one State is 3,838,000 acres in Illinois; the smallest, is 3,388 acres in Wyoming.

The national average yield, based on the ten years ending 1888, was 27 bushels per acre. The highest average is that of Washington (37.3 bushels). This State enjoys a moist climate and moderately low temperature. As many as sixteen States give yields ranging from 11 to 30 per cent. above the general average, but they are mostly in the northern zone. The lowest average yield is that of North Carolina (10.1 bushels).

In the following details concerning live-stock, the State averages are based upon ten annual estimates. The averages are consolidated from returns of county averages, and they represent the values upon the farms, or the prices paid to farmers in the primary markets.

Horses.—The average value per head of horses in the United States is 13*l.* 15*s.* They are dearest in New Jersey (20*l.*) ; Rhode Island (19*l.* 13*s.*) ; Massachusetts (19*l.* 8*s.*) ; and Delaware (19*l.*). In eleven other States (Maine, Connecticut, New York, Pennsylvania, Maryland, Michigan, Minnesota, Dakota, South Carolina, Georgia, and Florida) the average prices range between 15 guineas and 17 guineas; whilst in all other States they fall below 15 guineas. The lowest average price is 6*l.* 15*s.* (in Texas). The differences in value are attributable to differences of breed, distance from market, proportions of young and mature animals respectively in pastoral and manufacturing States, and to other local causes.

Cattle.—The general average value per head of cattle (exclusive of milch cows) is 4*l.* 2*s.* In eleven States the average value is more than 30 per cent. above the general average. These are—Massachusetts, 7*l.* 4*s.* ; Rhode Island, 6*l.* 17*s.* ; New Jersey, 6*l.* 15*s.* ; Connecticut, 6*l.* 12*s.* ; New York, 6*l.* 11*s.* ; New Hampshire, 6*l.* 7*s.* ; Pennsylvania, 5*l.* 13*s.* ; Maine, 5*l.* 13*s.* ; Vermont, 5*l.* 12*s.* ; Delaware, 5*l.* 12*s.* ; Ohio, 5*l.* 11*s.* The lowest State average is 1*l.* 14*s.* (in Florida). The lowest values are represented by Texan cattle, which came from Mexico originally, and from Spain more remotely. Up to fifteen years ago they were the export cattle of the United States, going to Cuba and adjacent islands, and still being sent there. One fat Shorthorn exported to England represents the value of about five of these Texan beasts. In the grazing regions of the distant Western States the average value is lower than in the Eastern States, which buy two-year-olds to feed and finish for the market.

Milch Cows.—The general average value is 5*l.* 10*s.* per head. In five States the average is more than 30 per cent. above this—Colorado, 8*l.* 3*s.* per head; Nevada, 7*l.* 15*s.*; New Jersey, 7*l.* 11*s.*; Montana, 7*l.* 8*s.*; and Massachusetts, 7*l.* 5*s.* The lowest State average is in Florida (2*l.* 16*s.* per head). The variations in value arise from differences in breed and development, better care and higher feeding in dairying districts than in non-dairying agricultural regions, and varying facilities for transport of dairy produce to market.

Sheep.—The general average value is 9*s.* per head. In nine States—Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Delaware, Maryland, and Pennsylvania—the average is more than 30 per cent. in excess of this, these State averages ranging between 15*s.* 6*d.* and 13*s.* per head. The lowest average is that of North Carolina (5*s.* 6*d.* per head). The differences in value depend upon breed and grade, quantity and quality of wool, value for meat-production, and distance from market. Each district follows its special line of sheep-husbandry—pedigree-stock growing, mutton-producing, raising early lambs, or exclusive wool-growing. Three-fourths of the sheep are Merino breeds and their grades. English breeds are numerous in some sections, and grade Mexicans are common in the South-west.

Swine.—The general average value of pigs is 1*l.* per head. In as many as seventeen States the average is 30 per cent. or more above this. These States form two compact series—Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey, and Delaware in the East; and New Mexico, Colorado, Utah, Nevada, Idaho, Wyoming, and Montana in the West. The highest average value per head is in Massachusetts (2*l.* 11*s.*). The lowest average value is 12*s.* per head (in Florida). The differences in value are determined by breed, age, weight, distance from market, and other local causes. In the South, the necessity for slaughtering in December or January reduces the average age and weight.

RECENT AGRICULTURAL INVENTIONS,

The subjects of Applications for Patents from May 29 to August 30, 1890.

N.B. Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application	Name of Applicant	Title of Invention
8263	WOODARD, A. N., and BRIGGS, W.	Potato digger.
8271	BURNS, D.	Finger bars of mowers and reapers.
8342	BENTALL, E. H.	Driving-wheels for harvesting machines.
8483	GRIFFIN, H. R.	Mowing machines.
8525	ALLEN, S. L.	Cultivators.

No. of Application	Name of Applicant	Title of Invention
8580	MOLISON, T. . .	. Potato dressing machine.
8736	ANTHONY, J. . .	. Roofing hay and corn stacks.
8986	MORECROFT, G. T. .	. Guiding device for coiling haulage ropes of power traction ploughs.
8923	EARNSHAW, R. F. .	. Drying wheat, barley, &c., in the straw as gathered.
9156	MINCROFT, F. and T. .	. Reaping machines.
9396	GREENFIELD, G. . .	. Drills for distributing seed, manure, &c.
9399	HOWARD, G., & GIBBS, G. .	. Harvesting machines.
9435	BAYLY, J. P. . .	. Ploughs.
9455	MALLETT, T. T. . .	. Hay-making machines.
9473	HARDINGHAM, G. G. M. .	. Apparatus for shearing wool and hair.
9525	DARBY, T. O. . .	. Implements for cultivating land.
9589	HARRISON, J. . .	. Haymaking machines.
9698	KURTS, M. . .	. Potato harvesting machine.
9739	SLEEP, W. H., and BURNS, T. B. . .	. Machine for eradicating charlock, thistles, &c.
9925	MARSH, F. . .	. Ascertaining internal heat of hay-stacks.
10083	LAMBERT, W. . .	. Hop-washing machines.
10126	PARHAM, J. N. . .	. Hay and corn turning machine.
10260	WRIGHT, R. . .	. Imparting revolving motion to shafts of machines used for cutting and grinding agricultural produce.
10583	LOVE, P. . .	. Frames for drying and curing grass and grain crops.
10649	BAYLY, J. P. . .	. Cultivator.
10810	MALLISON, C. . .	. Conditioning or drying grain.
10864	BUNTING, W. L. . .	. Chaff-cutting machines.
10971	BAWDEN, R. . .	. Ploughs.
10973	BIRTWISLE . . .	. Mowing and reaping machines.
11145	EDWARDS, S. . .	. Machines for pulping, &c., roots.
11314	BAYLY, J. P. . .	. Harrows.
11504	LIDSTONE, J. P. . .	. Elevators.
11661	SCOTT, J. . .	. Cultivator.
11695	VARLOW, H. J. . .	. Harrow.
11917	MAYNARD, R. . .	. Filling and compressing chaff into bags.
11922	CALLISTER, J. . .	. Combined clod-crushing, sowing and harrowing apparatus.
11981	MURDOCH, D. A. . .	. Hay-rick remover.
12101	HALL, R. . .	. Drills for distributing manure.
12294	GREENFIELD, G. . .	. Reaping and binding machines.
12441	MOUNTFORD, G. M. .	. Digging and riddling potatoes, &c.
12499	BAYLY, J. P. (<i>Staples and others</i>). . .	. Root cutting machine.
12558	BAMLETT, A. O. . .	. Harvesters.
12719	MARSDEN, H. M. . .	. Mowing machines.
12742	TILL, A. . .	. Plough or cultivator.
12933	HUXTABLE, J. . .	. Turn-wrest and other ploughs.
12946	STEVENSON, A. . .	. Reaping machines, &c.
12948	EARNSHAW, R. F. .	. Apparatus for drying cereals, &c.
12978	BUCKLE, E. . .	. Potato planter.
12984	FRING & SON. . .	. Hay and corn rakes.
13045	TRACY, H. R. and J. .	. Elevators.
13246	BAYLY, J. P. (<i>Buch- müller</i>). . .	. Grass receptacles for lawn-mowers.
13293	NORRIS, J. . .	. Hay press.
13349	THOMPSON, W. P. .	. Elevating and conveying grain.

No. of Application	Name of Applicant	Title of Invention
13468	PENGELLY, E., & others	Double movable blade coulter.
13518	HOLT, J.	Potato digger.
13539	OGLE, G. C. and W.	Hay tedder.
13558	CULPIN, T.	Sheaf-binding harvesters.
13679	EDWARDS, E. (<i>Nannmann</i>).	Seed drill machines.

Stable Utensils and Fittings—Horse-shoes, &c.

8323	HASLAM, J. N.	Foot pad for horses.
8514	MORITZ, C., and another	Instruments for clipping horses.
8650	BUTLIN, C.	Curb bits.
8862	UFFHAUSEN, A.	Safety bit.
9438	BURTON, W., and DURRANS, T.	Horse-boxes, stalls, stables, &c.
9460	LAKE, H. H.	Apparatus for releasing runaway horses from vehicles.
9471	DIXON, W.	Reins for riding and driving.
9939	LAKE, H. H.	Composition for use in packing horses' hoofs.
10103	BLOCH, E.	Horse-shoes.
10132	BARNES, J. E. L.	Removing loose hair from horses.
10191	FERGUSON, H. A.	Horse-shoes.
10269	D'AMILLY, and another	Horse-shoes.
10270	DAY, J. H. and A. S.	Drenching bottle for horses, &c.
10615	WITTEY, G. C.	Horse-shoes.
10660	BAYLY, J. P.	Horse clipping machine.
10838	BAYLY, J. P.	Hame tug.
10896	BUTLER, E.	Horses' nose-bag.
11206	BEAN, C. B.	Horses' nose-bags.
11399	CATOR, F. H.	Horse-shoes.
11563	CLOSE, F. A.	Saddles.
11665	HADDEN (<i>Bertolotto</i>).	Horse-shoes.
11744	CABANA, O.	Means for repairing harness.
11902	YEADON, J. A.	Horse collars and saddles.
12061	JUTSON, and another	Nailless shoes for horses, &c.
12236	LEHMANN, C. H.	Horse collar.
12469	EDLIN, E. H.	Combined curry-comb and scrape.
12589	HUME, H. B.	Preventing "crib-biting."
12560	LUNT, R., and another	Shaft tugs.
12686	TRIBE, D. J.	Stirrups.
12743	WILSON, J. A., & another	Mouth-bags for horses.
12904	ELLIOTT, F.	Hoof-pad.
13096	BAYLY, J. P. (<i>Rafferty</i>).	Improved bridle.
13546	CLEGG, H.	Driving bit.

Carts and Carriages.

8185	CAMPBELL, D.	Tip carts or waggons.
8515	GALVAYNE, S. F.	"Brake" for training horses to single harness.
9063	BLISS, F. D.	Adjustable nuts for carriage axles.
10756	SPARKE, W. H.	Adjustable shaft-stop.
12596	WHITTINGTON, R.	Preventing vehicles overturning in cases of accidents.
12646	HOLLINGWORTH, W.	Adjusting the load on heavy carts by moving axle and wheels.

Dairy Utensils, &c.

8551	STOKES, A. W.	Obtaining acidity or alkalinity in milk.
8624	HARRISON, W. T.	Automatically keeping cream mixed with milk to ensure uniform quality when being served.

No. of Application	Name of Applicant	Title of Invention
8700	WHITE, W. N. . . .	Packing-case for butter, eggs, &c.
8980	KINNAMON, A. L., & anr.	Butter moulds.
9532	BAILEY, W. H. . . .	Combined vacuum milking apparatus, and air-tight bottle for carrying and preserving milk and cream.
9633	DOUGLAS, J. H. . . .	Cheese presser.
9837	LISTER, R. A., and	
9838	PEDERSEN, M. . . .	Heating and cooling milk.
9852	SHARPLES, P. M., & D. T.	Centrifugal separators.
10028	PAYNE, W. H. . . .	Raising cream.
10461	SELLARS. . . .	Centrifugal machines.
10563	RANDLER, F. A. . . .	Sterilising milk.
10950	PERSSON, M. . . .	Preparation of condensed cream.
11341	COTTON, G. . . .	Milk pails.
11347	WAHLIN, A. . . .	Separators for cream and butter.
11554	REDFERN, G. F. (<i>Gronwald, &c.</i>) . . .	Sterilising milk.
11621	WESTON, G. H. . . .	Separators.
11711	AMIES, J. A. A. . . .	Milk filters.
12709	MARUS, T. and J. W. . .	Appliance for delivering milk to houses.
12955	HAMBICK, G. H. . . .	Manufacture and preservation of butter.
13559	NICHOLSON, S., & GRAY, J.	Milking machine.
13632	LOOSEMORE, R. F. . . .	Churns.

Poultry and Game, &c., Appliances.

8354	JESSEN, W. C. H. . . .	Preserving eggs.
8767	BISHOP, O. . . .	Machine for cramming chickens.
8774	HILLIER, W. H. . . .	Incubators, &c.
9236	GRIFFIN, J. . . .	Egg boxes.
9401	LOWE, W. S. . . .	Machine for making trays for receiving eggs for transportation.
9828	PAGE, T. C. . . .	Apparatus for poultry and duck raising.
10298	LOMAS, W. E. . . .	Improved nest egg.
10487	MITCHELL, W. J. . . .	Combined pheasant or poultry coop and run.
10553	NIGHTINGALE, F. . . .	Cases or protectors for eggs.
11812	GREEN, T. W. . . .	Combined coops and feeders.
12490	BATLY, J. P. (<i>Buehrig</i>)	Apparatus for testing and counting eggs.

Miscellaneous.

8596	WEBB, H. I. . . .	Shelters for sheep, &c.
8386	GARTON, R. . . .	Preserving and storing grass and forage plants.
9146	SAUNDERS, H. G. . . .	Ear-mark for sheep, &c.
9880	BAYLY, J. P. . . .	Dehorning apparatus.
9947	READE, J. . . .	Destroying dogs without pain.
10024	WEBBER, H. and J. C. . .	Protecting fruit, &c., crops from birds.
10412	BARNARD, BISHOP, & BARNARD, Ltd. . . .	Combined travelling box, and show bench for dogs, &c.
10823	BURTON, C. . . .	Sheep-shearing machines.
10907	GUILLAUME, F. . . .	do. do.
11121	WOOD, T. . . .	Machine for removing black currants from stalks.
11123	STEDMAN, G., and anr.	Hop funnel and gatherer.
11298	NIELSEN, J., & another	Udder protector for cows.
11468	PETTETT, G. E. . . .	Clipping and shearing apparatus.
11800	MOON, H. . . .	Artificial manure.
11859	TWEEDIE, M. . . .	Making ensilage.

No. of Application	Name of Applicant	Title of Invention
11908	CANNON, G. T.	. Mouth-bit for administering medicines.
11998	ADAMS, C. J. D.	. Hay rack for cattle stalls, &c.
12064	HADDEN, J.	. Instrument for dishorning cattle, &c.
12168	BERNAL, J. P.	. Cultivation of mushrooms.
12257	WOODROFFE, F. K.	. Protecting stacks from vermin.
12555	LEARNER, A. J.	. Composition for foot rot in sheep.
13275	BURGON, C.	. Sharpening sheep-shearing machines.
13377	KING, W. F.	. Apparatus for blowing the carcasses of calves, &c.
13694	KÖNIG, M.	. Malt curing apparatus.

Numbers of Specifications Published¹

(with prices in parentheses).

575 (4*d.*), 1324 (4*d.*), 1787 (6*d.*), 2049 (6*d.*), 2376 (8*d.*), 2679 (6*d.*), 3456 (8*d.*), 4526 (8*d.*), 4945 (6*d.*), 5921 (6*d.*), 6177 (8*d.*), 6344 (6*d.*), 6360 (6*d.*), 6456 (6*d.*), 6576 (8*d.*), 6797 (6*d.*), 7347 (6*d.*), 8354 (4*d.*), 8483 (11*d.*), 8980 (6*d.*), 9396 (11*d.*), 9473 (6*d.*), 9698 (6*d.*), 10132 (6*d.*), 10270 (6*d.*).

ALLOTMENTS AND SMALL HOLDINGS.

THE Board of Agriculture has issued a "Return of Allotments and Small Holdings in Great Britain," obtained by the Inland Revenue Department. It is prefaced by a Report, addressed to the President of the Board, by Major Craigie, the Director of the Statistical, Intelligence, and Educational Department, from which the following details are taken.

Definition of terms.—The allotments have been obtained by a special inquiry in upwards of 13,500 parishes. The small holdings are abstracted from the last annual Agricultural Returns. The allotments now enumerated are all areas under one acre in extent, and by far the larger number of these are below a quarter of an acre. Only about two-sevenths of the entire number exceed a quarter of an acre.

Results of present returns.—The returns show 455,005 cases in which separate detached allotments of less than an acre now exist in Great Britain. The number of small holdings other than allotments is 409,422.

For one in every seven of these holdings, or in 55,740 cases, the present occupier is also returned as owner of the soil, while in at least 12,613 other cases, reported during the inquiry, ownership of part of the holding is ascribed to the cultivator.

Increase of allotments.—The growth in number of fairly comparable allotments, in Great Britain as a whole, appears to be that indicated in the subjoined statement, from which, after making every

¹ Copies of these and other publications of the Patent Office may be obtained at the Patent Office (Sale and Store Branch), 38 Cursitor Street, Chancery Lane, London, E.C.

allowance for the possible imperfections of the earlier figures, it seems impossible to resist the conclusion that a large and important increase has taken place. It is noteworthy that the rate of annual increase in the last four years has been apparently three times as rapid as between 1873 and 1886 :—

Years	Allotments
1873	246,398
1886	357,795
1890	455,005

The changes in each of the several counties of England, and in Wales and Scotland, where the system of allotments holds but a secondary place, are shown in detail in the following Table :—

Number of Allotments under one Acre detached from Cottages as returned in the Years 1873, 1886, and 1890.

COUNTIES	Allotments			COUNTIES	Allotments		
	1873	1886	1890		1873	1886	1890
ENGLAND	No.	No.	No.	ENGLAND	No.	No.	No.
Bedford	8,384	12,602	15,194	Nottingham	11,317	14,795	21,253
Berks	5,007	8,309	10,231	Oxford	9,085	14,082	17,947
Buckingham	8,632	12,346	17,225	Rutland	1,252	1,878	2,197
Cambridge	8,596	10,576	18,428	Salop	1,002	1,714	2,584
Chesher	929	2,603	3,239	Somerset	9,508	14,908	16,477
Cornwall	1,782	3,137	2,539	Stafford	5,444	8,312	10,517
Cumberland	410	676	1,125	Suffolk	11,664	15,258	17,658
Derby	5,628	7,128	10,702	Surrey	1,263	3,153	5,206
Devon	7,063	10,264	10,470	Sussex	2,732	4,852	6,322
Dorset	7,332	9,135	10,895	Warwick	12,794	17,174	17,731
Durham	1,000	4,294	9,077	Westmoreland	53	295	950
Essex	8,269	12,238	15,770	Wilts	15,445	20,760	23,728
Gloucester	7,552	11,144	14,653	Worcester	4,919	7,322	9,983
Hants	6,713	8,590	12,614	York, East Riding	1,781	4,333	3,200
Hereford	997	1,857	1,440	York, North Riding	4,731	6,812	8,480
Hertford	5,137	8,316	10,014	York, West Riding	6,876	10,704	12,985
Huntingdon	3,376	5,402	5,580				
Kent	4,160	6,613	11,680	Total for England	242,542	348,872	441,024
Lancaster	992	3,706	4,447				
Leicester	17,168	18,496	23,396	Total for Wales	1,726	4,949	7,562
Lincoln	7,430	11,710	15,921				
Middlesex	689	1,844	3,098	Total for Scotland	2,130	3,975	6,419
Monmouth	569	767	1,802				
Norfolk	6,400	9,130	11,555	Total for Great Britain	246,398	357,795	455,005
Northampton	16,447	19,535	26,329				
Northumberland	908	4,142	8,247				

The allotments detached from cottages are divided into two groups only, viz., those under a quarter of an acre, and those of a quarter but under one acre in extent. The increase in both classes of allotments between 1886 and 1890 is about equally great.

Considerable local variations will be found in the tables between the proportions of these two grades of allotments. On the whole the smaller class outnumber the larger by much more than two to one. But in particular counties the proportions are reversed. While in England, as a whole, there are 310,698 allotments under a quarter of an acre, and only 130,356 above that limit, in Bedfordshire, Huntingdon, Norfolk, Suffolk, and Worcester the larger type of allotments prevails, and in the East Riding of York, Lincolnshire,

and Cambridge the allotments exceeding a quarter of an acre are nearly twice as numerous as those below that area.

The counties showing the largest number of allotments are Northampton with 26,229, Wiltshire with 23,723, Leicestershire with 23,396, and Nottingham with 21,253. An examination of the details now supplied indicates that many allotments are in urban parishes, and presumably occupied by artisans.

The mining counties of Durham and Glamorgan show a remarkable increase since 1886, their allotments appearing to have been more than doubled in the last four years. Large increases also appear in Kent and Stafford. In Devon, Essex, and Warwick comparatively little change is reported. In only four English counties is any decline apparent. In Cornwall the collectors ascribe the diminution as partly due to the removal of country labourers to more remunerative railway work. In Hereford, Northumberland, and the East Riding of Yorkshire, there appear to be also fewer allotments, some of those returned in 1886 having been improperly included under that title, while in other instances plots then occupied as allotments have been required for building and other purposes.

Increase in small holdings.—A comparison between the total number now shown of holdings not exceeding 50 acres in Great Britain, and the number accounted for in earlier enumerations, shows that the small holdings, other than allotments, appear to have increased as under :—

Years	Small Holdings
1875	389,941
1880	391,429
1885	392,203
1889	409,422

In this instance also the returns appear to show a considerably enhanced rate of increase in the last four years as compared with the ten preceding.

General returns of 1886 and 1890 combined.—Although it has not been deemed possible to extend the inquiry of 1890 into the question of cottage gardens or the various forms of secondary allotments, which it was attempted to include in 1886, the imperfect data then collected may nevertheless be referred to in general terms as showing, along with figures now published, at all events the minimum number of cases in which land is held in small plots.

To the 409,000 small holdings and 455,000 separate allotments now enumerated, and collectively representing 864,000 areas, it may be permissible to add those special allotments ascertained four years ago to have been granted by railway companies, and in which no change is believed to have occurred. If we further include the so-called garden allotments attached to cottages, which found a place in the 1886 returns, and the quoted cases, admittedly incomplete, in which cow-runs and potato grounds were stated to have been provided for labourers—all points in respect of which it is generally recognised no diminution, at all events, has occurred since 1886—

one form or another of *petite culture* will be seen to be in existence in Great Britain in at least 1,300,000 separate instances. This total is reached as follows:—

Not in this return	Small holdings other than allotments not exceeding 50 acres in extent (<i>now returned</i>)	409,422
	Allotments detached under 1 acre (<i>now returned</i>)	455,005
	Railway allotments detached under 1 acre (<i>as returned in 1886</i>)	39,115
	Garden allotments of and over $\frac{1}{2}$ acre attached to cottages (<i>as returned in 1886</i>)	262,614
	Railway garden allotments of and over $\frac{1}{2}$ acre attached to cottages (<i>as returned in 1886</i>)	6,142
	Potato grounds, cow-runs (<i>as returned in 1886</i>)	128,448
Total		<u>1,300,746</u>

Hence, all the information now available points to the probability that some 1,300,000 persons in Great Britain are at present in occupation of quantities of land not exceeding fifty acres in extent. Of these persons, more than a million appear to occupy less than five acres each. The figures, therefore, indicate a somewhat larger distribution of land among the people of this country than has been sometimes regarded as probable.

The following Table shows the number of allotments, and of small holdings, in each county of Wales:—

Number of Allotments under 1 Acre in extent, detached from Cottages, and of Small Holdings of $\frac{1}{2}$ of an Acre to 50 Acres inclusive, in each county of Wales.

COUNTIES (continued)	ALLOTMENTS (detached from cottages)			SMALL HOLDINGS	
	Under $\frac{1}{2}$ of an acre	Of $\frac{1}{2}$ but under 1 acre	Total	Total number of small holdings to 50 acres (inclusive)	Number of such holdings owned by the occupiers
WALES	No.	No.	No.	No.	No.
Anglesey	625	27	652	2,989	213
Brecon	463	27	490	1,892	210
Cardigan	379	102	481	4,789	1,080
Carmarthen	730	14	744	5,583	573
Carnarvon	319	191	510	5,465	403
Denbigh	81	26	107	4,402	498
Flint	64	41	105	3,421	349
Glamorgan	3,219	136	3,355	4,536	411
Merioneth	102	—	102	2,187	192
Montgomery	522	48	570	3,867	329
Pembroke	265	17	282	4,275	404
Radnor	163	1	164	1,255	208

The Table on page 670 shows the number of allotments, and of small holdings, in England, Wales, and Scotland, and in each county of England.

Number of Allotments under 1 Acre in extent, detached from Cottages, and of Small Holdings of $\frac{1}{2}$ of an Acre to 50 Acres inclusive, in England, Wales, and Scotland, and in each county of England.

COUNTIES, &c.	ALLOTMENTS (detached from cottages)			SMALL HOLDINGS	
	Under $\frac{1}{2}$ of an acre	Of $\frac{1}{2}$ but under 1 acre	Total	Total number of small holdings to 50 acres (inclusive)	Number of such holdings owned by the occupiers
Total for Great Britain	No. 322,921	No. 132,084	No. 455,005	No. *409,422	No. 55,740
England	310,698	130,326	441,024	308,378	47,531
Wales	6,932	630	7,562	44,661	4,880
Scotland	5,291	1,128	6,419	56,383	3,329
ENGLAND					
Bedford	6,942	8,252	15,194	3,142	393
Berks	8,659	1,572	10,231	3,101	697
Buckingham	11,347	5,878	17,225	3,749	726
Cambridge	4,618	8,810	13,428	6,564	1,016
Chester	2,727	512	3,239	10,929	1,070
Cornwall	2,266	273	2,539	11,774	1,322
Cumberland	1,061	64	1,125	4,275	843
Derby	10,030	672	10,702	10,318	996
Devon	8,465	2,005	10,470	11,613	1,925
Dorset	8,220	2,675	10,895	4,118	618
Durham	8,789	288	9,077	4,614	506
Essex	11,042	1,728	12,770	5,653	1,132
Gloucester	9,038	5,615	14,653	9,552	2,057
Hants	9,316	3,298	12,614	7,095	1,672
Hereford	1,056	384	1,440	5,054	669
Hertford	8,961	1,053	10,014	2,924	581
Huntingdon	2,745	3,235	5,980	2,324	469
Kent	10,745	915	11,660	7,817	1,652
Lancaster	4,228	219	4,447	16,856	1,713
Leicester	20,434	2,962	23,396	5,770	722
Lincoln	5,825	10,096	15,921	20,692	4,092
Middlesex	2,935	163	3,098	2,578	664
Monmouth	1,518	284	1,802	4,071	633
Norfolk	5,184	6,671	11,855	12,207	1,675
Northampton	17,075	9,154	26,229	4,707	741
Northumberland	2,953	294	3,247	3,889	397
Notts	18,926	2,327	21,253	6,329	855
Oxford	11,453	6,494	17,947	3,721	617
Rutland	1,220	977	2,197	805	80
Salop	1,943	641	2,584	9,684	1,013
Somerset	13,022	3,455	16,477	13,895	2,874
Stafford	8,972	1,545	10,517	11,153	1,376
Suffolk	8,019	9,639	17,658	6,355	1,182
Surrey	4,825	941	5,266	4,274	1,313
Sussex	6,143	679	6,822	6,203	1,365
Warwick	11,524	6,207	17,731	5,575	837
Westmoreland	928	22	950	2,279	365
Wilts	15,958	7,765	23,723	5,498	1,052
Worcester	4,462	5,521	9,983	7,561	1,197
York, East Riding	1,118	2,082	3,200	5,329	621
„ North Riding	5,903	2,577	8,480	9,672	768
„ West Riding	10,603	2,382	12,985	24,709	3,085

* Including 12,613 holdings partly rented and partly owned, of which 11,688 are in England, 890 in Wales, and 335 in Scotland.

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

SUMMARY OF AGRICULTURAL RETURNS OF GREAT BRITAIN FOR 1890.

Notes.—The Returns were collected on June 4 in the Years 1888, 1889, and 1890.

ACREAGE OF LAND IN GREAT BRITAIN UNDER—

Year	Wheat	Barley	Oats	Potatoes	Hops
	Acres	Acres	Acres	Acres	Acres
1888	2,564,237	2,085,561	2,882,252	590,160	58,494
1889	2,449,354	2,121,530	2,888,704	579,222	57,724
1890	2,386,836	2,111,178	2,902,998	529,661	54,555
1890 compared with 1889	Increase {	—	—	14,294 or 0·5 per cent.	—
	Decrease {	63,018 or 2·6 per cent.	10,352 or 0·5 per cent.	—	49,561 or 8·6 per cent.
1890 compared with 1888	Increase {	—	25,617 or 1·2 per cent.	20,746 or 0·7 per cent.	—
	Decrease {	177,901 or 6·9 per cent.	—	—	60,499 or 10·2 per cent.

NUMBER OF CATTLE IN GREAT BRITAIN.†

YEAR	CATTLE			
	Cows and heifers in milk or in calf	2 years old and above	Under 2 years old	Total
	No.	No.	No.	No.
1888	2,450,444	1,434,305	2,244,626	6,129,375
1889	2,433,639	1,453,859	2,252,057	6,139,555
1890	2,537,990	1,439,119	2,531,523	6,508,632
1890 compared with 1889	Increase {	104,351 or 4·3 per cent.	—	279,466 or 12·4 per cent.
	Decrease {	—	14,740 or 1·0 per cent.	—
1890 compared with 1888	Increase {	87,546 or 3·6 per cent.	4,814 or 0·3 per cent.	286,897 or 12·8 per cent.
	Decrease {	—	—	379,257 or 6·2 per cent.

SUMMARY OF AGRICULTURAL RETURNS, &c.—*Continued.*

NUMBER OF SHEEP AND PIGS IN GREAT BRITAIN.

YEAR	SHEEP AND LAMBS			PIGS
	Sheep	Lambs	Total	
	No.	No.	No.	No.
1888	15,726,947	9,530,202	25,257,149	2,404,344
1889	15,862,132	9,769,888	25,632,020	2,510,803
1890	16,756,568	10,515,891	27,272,459	2,778,609
1890 compared with 1889	Increase . {	894,436 or 5·6 per cent.	746,003 or 7·6 per cent.	1,640,439 or 6·4 per cent.
	Decrease . {	—	—	—
1890 compared with 1888	Increase . {	1,029,621 or 6·5 per cent.	985,689 or 10·3 per cent.	2,015,310 or 8·0 per cent.
	Decrease . {	—	—	—

TABLE SHOWING THE ACREAGE UNDER HOPS IN ENGLAND, AS RETURNED UPON JUNE 4 IN THE YEARS 1888, 1889, AND 1890.

COUNTIES	1888	1889	1890	COUNTIES	1888	1889	1890
	Acres	Acres	Acres		Acres	Acres	Acres
Berks	10	10	11	Suffolk . . .	29	29	29
Gloucester . .	10	4	14	Surrey	2,173	2,101	1,874
Hants	2,972	2,905	2,614	Sussex	7,403	7,282	6,787
Hereford . . .	6,559	6,850	6,519	Worcester . . .	2,764	2,939	3,058
Kent	36,448	35,487	33,525				
Notts	18	16	14	Total	58,490	57,724	54,555
Salop	104	101	110				

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AGRICULTURAL ADMINISTRATION IN
AUSTRIA-HUNGARY.

CONSIDERING the admitted importance of Austria-Hungary as an agricultural country, and the extent to which its products (such, for example, as wheat) come into competition with our own, it is a little surprising to find so few references to its agriculture in the pages of this Journal, or, indeed, in English literature generally. A recent visit to the country, as the official representative of the Society at the International Agricultural Congress of Vienna, appeared to afford an opportunity for obtaining some particulars as to the way in which agricultural affairs are managed and the cultivation of the soil is practised in Austria-Hungary; and an attempt has therefore been made—it is believed for the first time—to bring under review in these pages all the factors of the agricultural administration and practice of the Empire.

It is needless to say that this task has been by no means an easy one. It is always difficult for a foreigner to assess the proper value or proportion of the facts brought under his notice; but many conversations on the spot, with officials and others, have been supplemented and corrected by a careful study at home of a great variety of official reports, documents, and statistics, and it is believed that the facts recorded below are as correct and as complete as the information available has rendered possible.

Exigencies of space compel me on the present occasion to limit my remarks to what may be called the administrative part of Austro-Hungarian agriculture: the systems of land-tenure, the different classes of proprietors, the central and provincial control over agricultural matters, and the various agencies—such as the Ministry of Agriculture, agricultural schools, experimental stations and societies—for the general advancement of agriculture in the Empire. In short, I propose to give in the following pages as complete and accurate a statement as possible of what the State does for the agriculturist. The other side of the shield—an examination of what the agriculturist does for the State by contributions to its support in the shape of land tax, surtax, house tax, tax on earnings, consumption taxes on food, liquors, sugar, and other commodities, and indirect taxation generally—must be reserved for a future occasion, as must also any description of the actual cultivation of the soil in the different provinces.

RACES AND POPULATION.

Austria-Hungary is a curious agglomeration of races, creeds, languages, customs, and interests. We are accustomed to think of the Austrians as being all Germans, and of the Hungarians as being all Magyars. But the Czechs, Poles, Ruthenians, Croats, Roumanians, and Serbs have also to be reckoned with; and the first-named, who constitute at least two-thirds of the population of Bohemia, have of late been strongly asserting themselves, and agitating for a measure of independence that the Vienna Government seems disinclined to grant. The following statement, taken from the last decennial Census of 1880, shows in the briefest and most telling way the great variety of races amongst the subjects of His Imperial and Royal Apostolic Majesty the Kaiser-König Francis Joseph, and indicates one of the initial difficulties of governing the Empire:—

Nationalities	Austria	Hungary
Germans	8,005,452	1,972,115
Bohemians (Czechs), Moravians, and Slovaks	5,181,611	1,892,806
Poles	3,239,356	—
Ruthenians	2,794,554	360,051
Slovens	1,140,548	86,401
Serbs and Croatsians	563,371	2,359,708
Italians	668,653	—
Roumanians	190,799	2,423,387
Magyars	9,887	6,478,711
Gipsies	—	82,256
Others	—	83,940
Total	21,794,231	15,730,375

Into the grave political questions involved in the almost open rivalry between Austria and Hungary, and the forcing of the hand of the former State by the economic and commercial legislation of the latter (such, for instance, as the Zone tariff on railways), it is, fortunately, no part of my province to go. But, as we are accustomed to speak of Austria as an entity, it is well to remember that it is compounded of no less than fourteen different Provinces, all of which have their special peculiarities of race and language, and in many of which the anti-German element is very strong. In wealth, population, and civilisation, the western half of the Empire is incontestably superior. But it is, on the other hand, as will be seen by a glance at the Map on p. 677, geographically less compact, and is inhabited by populations differing more widely than those of the kingdom of Hungary in the degrees of civilisation which they have respectively attained.

The subjoined Table gives the names of each province of Austria-Hungary, with its area in square miles, the estimated number of its inhabitants at the end of 1888, and the density of its population:—

Provinces	Area, English square miles	Estimated population, Dec. 31, 1888	Population per square mile (1888)	Provinces	Area, English square miles	Estimated population, Dec. 31, 1888	Population per square mile (1888)
<i>Austria:</i>				<i>Kingdom of Hungary:</i>			
Lower Austria . . .	7,654	2,591,949	338	Hungary (including Transylvania) . . .	108,258	14,859,288	137
Upper Austria . . .	4,631	775,719	167	Croatia and Slavonia . . .	16,773	2,068,161	113
Salzburg . . .	2,787	170,701	61	Town of Fiume . . .	8	22,384	2,704
Styria . . .	8,070	1,268,920	146	Total, HUNGARY	125,039	16,970,813	135
Carinthia . . .	4,005	359,121	89				
Carniola . . .	3,556	499,831	129	<i>Grand Total for Austro-Hungarian Monarchy</i>	<i>240,942</i>	<i>41,463,809</i>	<i>172</i>
Coast-land . . .	3,084	686,630	222				
Tyrol and Vorarlberg . . .	11,324	918,367	81				
Bohem'a . . .	20,060	5,780,938	283				
Moravia . . .	8,583	2,222,370	258				
Silesia . . .	1,987	594,573	299				
Galicia . . .	30,807	6,455,885	212				
Bukowina . . .	4,035	637,354	157				
Dalmatia . . .	4,940	521,938	105				
Total, AUSTRIA	115,903	24,483,996	211				

I have placed the Austrian and Hungarian provinces (or, as they are sometimes called, the Cisleithan and Transleithan provinces—from the small river Leitha, which partially divides the two) on opposite sides of this Table, in order to accentuate the fact that each has practically complete autonomy in the administration of its affairs. In fact, it may assist the reader's comprehension of what follows if he will regard Austria and

Hungary, though constituting one body politic, as being two absolutely distinct countries, "as separate as England is from France," to use a simile employed by Professor Arminius Vambéry—than whom no one can speak with more authority—in a letter to me dated November 26, 1890. Judging by all appearances, the two countries appear, indeed, to be united in little else than that the same head wears the crowns of both.

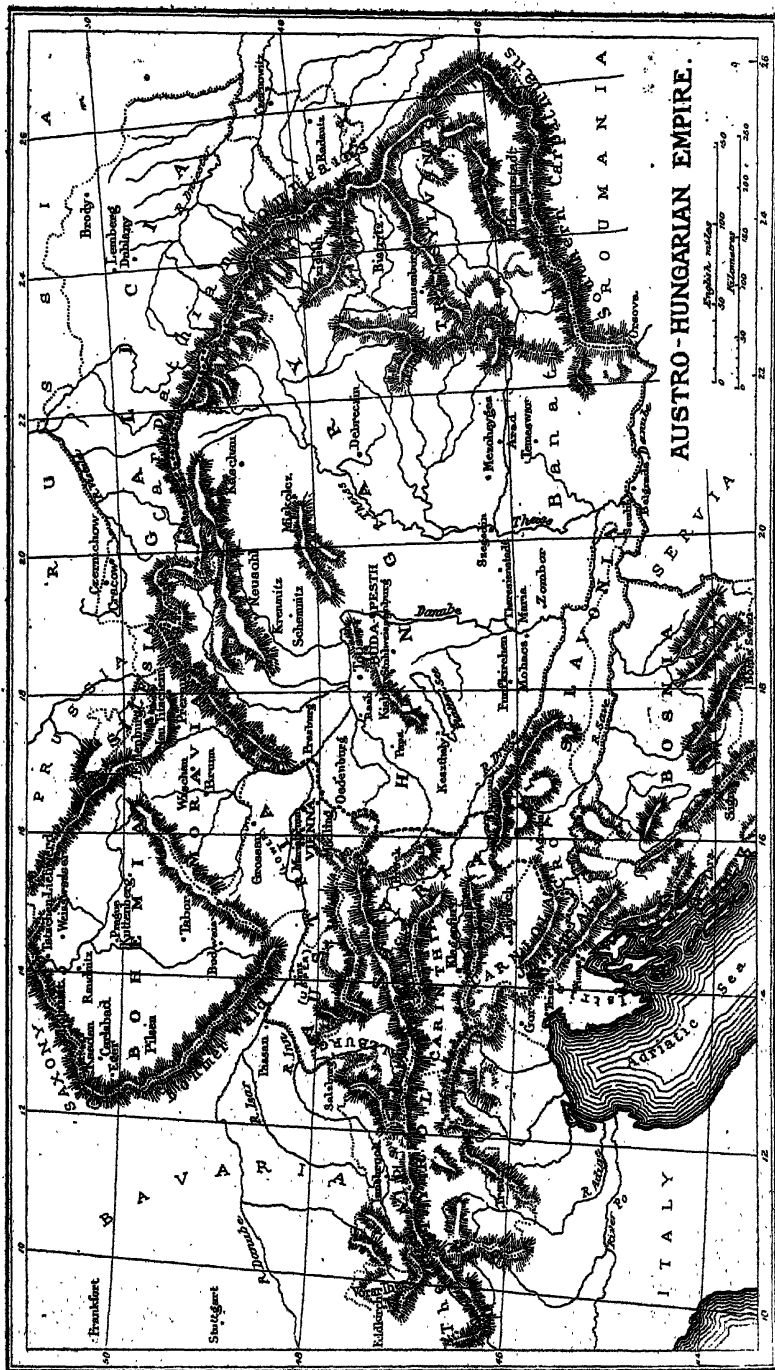
For convenience the particulars relating to the two countries have, in the following pages, been grouped together under the same heading; but there is little in common between the two systems, and an attempt commenced early in this investigation to summarise the similarities and the divergencies of the two resulted in so hopeless a mass of reservations and qualifications that it was abandoned in despair.

Austria and Hungary have their own separate and independent departments for all matters of internal administration, including, of course, agriculture. In Austria an additional complication arises from the Provincial Diets (Landtag), possessed by all the provinces, and which have control over local representative bodies, and in part the regulation of affairs relating to cultivation of the soil, education, charity, and public works. All matters associated with agricultural legislation not expressly reserved to the Reichsrath, or central Parliament (such as the laws concerning taxes, imposts, and infectious diseases of animals), are in Austria regularly dealt with by the Diets. There are no Provincial Diets in Hungary and Transylvania, but Croatia and Slavonia have a Diet of ninety members between them.

THE AGRICULTURAL POPULATION.

Estimates differ as to the proportion of the people engaged directly or indirectly in agricultural pursuits. The Census of 1880 gives a certain amount of information on the subject; but as the figures of Austria and of Hungary are not calculated on a uniform plan,¹ it is impossible to give exact details. The Austrian census described 2,365,153 persons (or 10·7 per cent. of the total population) as landlords and tenants, 3,791,512 (or 17·1 per cent.) as foremen and labourers, 5,697,076 (or 25·7 per cent.) as families of agriculturists, and 335,237 (or 1·5 per cent.) as domestic servants. Similarly, there appear in the Hungarian

¹ This is a defect attaching to all the statistics of the two divisions of the Empire. The returns for Austria and for Hungary appear at different intervals, for different periods, and are not made out on a common plan; so that it has been found very difficult to arrive at reliable figures which are strictly comparable.



AUSTRO-HUNGARIAN EMPIRE.

official figures 1,451,707 landlords and tenants (or 9·4 per cent.), and 4,520,671 (28·9 per cent.) as persons employed. But here the parallelism ceases. The Austrian total of persons employed in agriculture, including children and servants, is 12,188,998, or 55 per cent. of the whole number; but there is no corresponding figure for Hungary. Considering, however, that Hungary has far fewer manufactures and industries than Austria, it will hardly be an over-estimate to assume that something like two-thirds of the population of the Austro-Hungarian Monarchy are dependent upon the cultivation of the soil.

In Austria, the number of persons engaged in agriculture and forestry is largest in Dalmatia (82·7 per cent. of the population). In Galicia the proportion is 74·2 per cent.; in Istria, Bukowina, and Carniola, from 70 to 73 per cent.; in Carinthia, 68·6 per cent.; in Styria, Görz-Gradiska, and Tyrol, from 63 to 66 per cent.; in Vorarlberg and Salzburg, upwards of 55 per cent.; in Upper Austria and Moravia, from 48 to 49 per cent.; in Bohemia, 40·9 per cent.; in Silesia, 35·2 per cent.; and in Lower Austria, which includes the capital, Vienna, 27·2 per cent.

NATURAL FEATURES OF THE COUNTRY.

In estimating the amount of land available for agricultural purposes, a very large deduction must be made from the total area of 240,942 square miles shown in the Table on page 675. Austria-Hungary is, after Switzerland, the most mountainous country in Europe; about three-fourths of its surface consist of mountains or hills, the rest being made up of valleys and plains. Barely a third of the land is arable; forests cover another third; while the remaining portion consists of meadows, pasture-land, or vineyards.

The following statement, taken from the latest official figures, gives the percentages more exactly:—

	Percentage of total area		
	Austria	Hungary	Whole Monarchy
Arable and garden land . . .	36·7	40·9	38·9
Vineyards	0·8	1·3	1·1
Pastures and meadows . . .	23·8	23·9	23·9
Woodlands	32·6	28·1	30·2
Lakes and fishponds . . .	0·4	0·3	0·3
Total area subject to taxation . .	94·3	94·5	94·4
Exempt from taxes	5·7	5·5	5·6
Total	100·0	100·0	100·0

The great extent of the surface of the Empire, its continental position, the marked differences in altitude, together with other

varying physical features, make it impossible to describe the climate in one word. The sun is hotter in Hungary than it is ordinarily in England, and one morning in the third week of September, when the best stallions at Mezőhegyes were specially paraded for my inspection at 6.30 A.M., the temperature was already so high that a shaded view-point was very acceptable. The winters in the plains are severe and prolonged, and there is often considerable drought in the eastern parts. Yet, on the whole, the climate may be said to be mild and agreeable.

For many purposes of comparison, Austria is officially separated into four divisions, and there may be advantages in adopting these here. The four divisions are called respectively:—

1. *The Alpine and surrounding Provinces*, consisting of Lower and Upper Austria, Salzburg, Styria, Carinthia, Carniola, Tyrol, and Vorarlberg.

2. *The North-West Provinces*, comprising Bohemia, Moravia, and Silesia.

3. *The North-East Provinces*.—Galicia and Bukowina.

4. *The Karst Provinces*.—Görz, Istria, Trieste, and Dalmatia.

Hungary is generally dealt with as a whole, though occasionally Transylvania has been separated from it, and at other times Croatia and Slavonia. These last are, indeed, by no means constant factors in Hungarian statistics.

In the Alpine Provinces, the frequent inclemency of the weather and the nature of the soil make stock breeding, stock feeding, and forestry the most remunerative agricultural employments. The population is almost wholly German.

The North-West Provinces are the most fertile and the most advanced in the Empire: the climate is good, the land is excellent, the cultivators are skilful and enterprising; and, as a consequence, agriculture is in a very flourishing condition. The best kinds of grain are grown, and the best breeds of animals reared. There is much stall-feeding of stock for the great markets, the refuse of the very numerous sugar-factories, breweries, and distilleries being utilised in this way. Steam-ploughing, artificial manuring, and high cultivation generally, are practised. Half the inhabitants are Germans and half Czechs.

In the North-East Provinces agriculture is in a very rudimentary condition, and is almost the only occupation of the people. Many cattle are raised and fed in the common pasture-lands, the Galician or Podolian breed being highly esteemed for the excellence of its beef. The forests are of great extent. The inhabitants are of the Slav race—Poles and Ruthenians, besides Wallachs and Jews.

The Karst Provinces consist chiefly of poor pasture-lands and denuded woods, which the State is trying to reafforest. The chief agricultural industries are distilleries of oil and liqueurs (such as Maraschino), the preservation of fruits (which are cultivated in a peculiar manner), and silkworm-culture. The inhabitants are Southern Slavs.

Hungary consists essentially of an enormous central plain, no doubt once the bed of an ancient lake or inland sea, surrounded by mountains and woods. Agriculture is throughout in a very primitive condition, except on some of the great estates. Over a-third of the population are Magyars, almost a third Croats and Roumanians, and the remainder comprise Germans, Slavs, Jews, and other races.

Details as to the methods of cultivation of the soil and the various crops raised must of necessity be postponed for a later occasion; but it may be said generally, that there is every degree of "intensity" in the systems practised, from the scratching of the earth with a wooden plough to steam-cultivation, and from the use of the flail to steam-threshing by electric light. One reason for this great variety is to be found in the conditions of land-tenure in the Empire, which it will be necessary to describe at some length.

SYSTEM OF LAND-TENURE.

The dawn of improvement in agricultural methods in Austria-Hungary dates from the political troubles of 1848. Though villenage had been officially abolished under Maria Theresa in the last century, yet up to little more than forty years ago the peasants were practically serfs. They were legally subject to forced labour, and it was by such labour that the estates of the great proprietors, or nobles, were cultivated. Earl Cathcart, in his interesting Biography of Sir Harry Thompson, which appeared in Vol. X. (1874) of the 2nd Series of this Journal, has fortunately preserved for us a graphic picture of the state of affairs in the feudal times, from the pen of one of the acutest observers and most accomplished writers whose contributions have enriched these pages. Sir Harry Thompson, then a young man of twenty-five, doing the Grand Tour, like so many of his contemporaries, writes as follows to his father, on October 22, 1834, from Pesth:—

There are at present in Hungary two classes—nobles and slaves. The Emperor of Austria has long tried to break through the almost boundless privilege of the aristocracy; but as long as three out of four estates are nearly all occupied by nobles, I do not see how he is to bring it about.

The nobles pay no taxes or imposts of any kind, so that you may form some idea of the state of society. In Hungary a noble may screw his boor out of his last farthing, and imprison him when he has no longer anything to pay; but if by chance he should lose his temper, and hang or shoot him, he must pay a fine to the Emperor of nearly thirty shillings. The noble is considered to be of a different species from the peasant, and in consequence is allowed to live as a drone in the hive, feeding on the produce of the others' labours, disclaiming all active employments, and feasting on the sense of his own dignity.

You see at every step the consequence of such a wretched system. No bridges, no roads, no great public works can be undertaken while the only classes able to pay are exempt from the payment of tolls and rates, by which alone the expenses could be defrayed. The wretched boors are in a state of the most deplorable ignorance, and consequent immorality.

This state of things, which existed in a modified form even in the more civilised Austria, endured until the revolutionary year of 1848, when land laws applying to the whole Empire were decreed which abolished the feudal system, with all its privileges, exemptions, and monopolies.

In return for the *robot* (from the Czechish word "*robota*"), or forced labour of the peasant, with its attendant dues in money or kind, a certain portion of land had been allotted to him by the "noble" whose serf he was, this land being cultivated by the peasant exclusively on his own behalf and for his own profit. By the new law the conditions of forced service and feudal imposts were abolished, and the peasant was invested by the State with the free and unconditional ownership of the land allotted to him.

It is not necessary to describe at length the method by which this sweeping change was made acceptable to, or endurable by, the great proprietors, with whose immediate fortunes it so ruthlessly interfered. A certain amount of compensation for the abolition of these feudal rights (about two-thirds of the estimated pecuniary value) was assigned to them, in the shape of 5 per cent. bonds; but as half the amount necessary for the service of these bonds was assessed as a surtax on the local taxation of each province, of which the "nobles" had to pay their share, the actual compensation was only one-third of the value of the properties alienated.

So great a change could not, of course, be effected without serious inconvenience and heavy pecuniary loss to many of the great proprietors; but it taught them the useful lesson that, instead of leading idle and worthless lives, and resting content with the yield of the soil under the primitive agricultural methods and lazy administration of the past, they must, to escape ruin, cultivate their estates more carefully, and supply the place of forced labour by the application of scientific knowledge

and the introduction of efficient implements. The great Exhibition of 1851 attracted the attention of all the world to the improvements which had been made in machinery of every kind; and one result of the original Crystal Palace was that a vast quantity of English agricultural implements was imported into Austria and Hungary, to take the place of the hand-labour that was no longer available. To this day English machinery has maintained its pre-eminence on the large estates of Austria-Hungary, though the trade connected with it is no longer so profitable as it used to be, on account of the competition of native makers.

The greater attention paid to the cultivation of the soil has had the result that might have been anticipated—an immense improvement in value, so that the market-price of land has increased enormously since the change. In the fertile districts of Bohemia and Moravia, the rental of the best properties is, indeed, quite surprisingly high.

THE GREAT, OR SEIGNORIAL PROPERTIES.

It will be seen, from what has been said above, that whilst the laws of 1848-9 created an entirely new class of peasant-proprietors, they left generally intact the old class of great proprietors, whose estates are at this day as large as (and much better cultivated and more remunerative than) they were in 1848. The new law did not deprive the great proprietors of their own estates, or of the privileges attaching thereto; it only took from them certain feudal rights over the property of others. Although the tendency of subsequent legislation has been to limit the privileges of the great landowners, as in the recent law abolishing the exclusive rights of brewing and distilling (propination), the powers and rights given by their own estates remain undiminished.

These properties are known as *Grossgrundbesitz* (literally, large estates), to distinguish them from the peasant properties, or *Kleingrundbesitz* (small estates); although there are to be found in the former class estates consisting of only a few acres, and in the latter some including several hundreds of acres, but not possessing the special privileges of the seignorial properties.

In Austria the two sorts of property are inscribed in different registers, called *Landtafel* for the seignorial properties and *Grundbücher* for the peasant properties. It is provided, however, that the number of estates registered in the *Landtafel* can only be augmented by special authority of the Provincial Diet. In Hungary there is no such distinction, all properties of what-

ever size being inscribed in the Grundbücher. "Grossgrundbesitz" is in that country merely a colloquial term for large properties—and only large properties, but has no legal or formal signification.¹

The owners of seignorial properties constitute special classes of electors, both to the Austrian Parliament (Reichsrath) and to the Provincial Diets, separate representation being accorded to all landowners paying land-taxes of not less than 50, 100, 200, and 250 florins, according to the provinces in which their estates are situated. (Females in possession of their own property are entitled to vote under this franchise.)

The largest seignorial properties are those of Prince Schwarzenberg (504,000 acres), the reigning Prince of Liechtenstein (474,000 acres), the Archduke Albert (300,000 acres), the Emperor (200,000 acres), and the Archbishop of Olmütz (136,250 acres). The largest proportion of the seignorial properties is found in Bohemia, in Moravia, and in Galicia. In these provinces the great proprietors have from time immemorial possessed estates of wide extent. Most of these domains may be reckoned, on the average, at not less than 10,000 acres of arable land, and from 6,000 to 10,000 acres of woodland. In Bohemia alone there are 63 estates, with an average of more than 14,400 acres each; and the area of many is as much as 60,000 acres. In Galicia, again, three-fifths of the whole productive surface is cultivated by large proprietors, whose estates vary in extent from 1,000 to 2,000 acres. Extensive properties belonging to religious foundations also prevail in the Bukowina, where, however, they chiefly consist of woodland.

Nearly all these properties belong to the high nobility; and, as a rule, they are farmed by the owners, with the aid of a director and an elaborate staff of managers. In the fertile provinces of Bohemia and Moravia, however, where are the great sugar-factories, portions of estates are sometimes let out to the companies or individuals who exploit these factories. Thus, the Wischau sugar-factory, near Brünn, in Moravia, managed by a company of shareholders, has 10 farms in its total occupation of 5,800 acres, 1 of which belongs to Her Imperial Highness the Archduchess Maria Theresa, 2 belong to the Archbishop of Olmütz, 2 to the heirs of a baron, 2 to each of two ritters (chevaliers), and 1 to a religious foundation. Another large factory, with dependent farms extending over 7,050 acres, at Lundenburg, on the borders of Moravia and

¹ The law as to transfers of land, mortgages, leases, rent, the like, will be dealt with when the actual practice of agriculture in the country is discussed in a future paper.

Lower Austria, was found to belong, as to 5,650 acres, to the Prince of Liechtenstein, and as to the remaining 1,400 acres, to the enterprising proprietor of the factory, who was careful to direct attention to the fact that these latter were not inscribed in the provincial Landtafel.

The seignorial property in the Alpine Provinces chiefly belongs to the State, which owns in all 4,500,000 acres of forest. Other large owners of forests are the Emperor (184,000 acres), the Archduke Albert (230,000 acres), the reigning Prince of Liechtenstein (358,000 acres), Prince Schwarzenberg (293,000 acres), the Crédit Foncier of Vienna (200,000 acres), Johann Liebig & Co., in Galicia (120,000 acres), the Archbishop of Olmütz (117,000 acres), and Prince Joseph Colloredo Mannsfeld (115,000 acres).

The proportion of the seignorial properties to the entire productive area in Austria, and the percentage of forests in the seignorial properties, are as follows:—

	Proportion to total productive area per cent.	Proportion of forest in seign- orial properties per cent.		Proportion to total productive area per cent.	Proportion of forest in seign- orial properties per cent.
Silesia . . .	50·5	53	Upper Austria . .	17·0	89
Bukowina . .	39·5	85	Carniola . . .	14·5	91
Galicia . . .	39·0	55	Carinthia . . .	13·0	91
Moravia . . .	37·5	58	Tyrol and Vor- } arlberg . . .	10·0	92
Bohemia . . .	34·0	62	Coast . . .	2·5	93
Salzburg . . .	26·5	93	Dalmatia . . .	1·0	24
Lower Austria .	22·5	65			
Styria . . .	19·5	82			

It is only right to say at once, that nearly all the improvements in the agricultural practice of the Empire have been made on the estates of the seignorial proprietors, and that, where a peasant-proprietor has followed improved methods, he has done it as a copyist, because he sees it pays. In a great many instances, however, and especially in Hungary and the provinces to the east and north-east of it, the peasant still cultivates the soil in the same fashion as he did before his emancipation in 1848.

In the northern provinces of Bohemia and Moravia improvement is, perhaps, more due to the tenants of the seignorial properties than to the owners themselves. The proprietors of sugar-factories, breweries, distilleries, and the like, require for the profitable exploitation of their businesses considerable tracts of land and large quantities of live-stock. Their rents are high, and to obtain the full value from their holdings they have been obliged to introduce the latest machinery and agricultural imple-

ments, to purchase large quantities of artificial manures—in a word, to practise high farming. Their success and enterprise have naturally had an effect upon the peasants who surround them. Chev. Max de Proskowetz, to whose patient kindness I am indebted for very much of the information in this paper, and for the avoidance of many errors, says, indeed, of his native Moravia that the peasants have, since 1849, brought nearly all their pastures under the plough. Sowing and threshing machines are seen not at all uncommonly on their farms, and even artificial manures are sometimes employed. He mentions particularly the *penchant* of the peasants for the introduction of foreign seeds—so much so that the famous Hanna barley (indigenous to the rich plain of the Hanna, the most fertile part of the province) has almost entirely disappeared from the fields.

THE PEASANT PROPERTIES.

These properties are, as stated already, inscribed in a different register (Grundbuch) from those of the seignorial estates. There does not appear to have been any recent cadastral survey or return showing the number of holdings of different sizes in Austria; but a Consular report of 1889 [C. 5618-12] gives the following as the sizes of holdings in Hungary in jochs (1.43 acres), and the distribution of such properties amongst different classes of owners:—

Size of properties in Hungary, in jochs	Number of proprietors	Total number of jochs	Distribution of property in Hungary	Jochs	Per cent. of total
Under 30	2,348,107	15,027,889	Crown lands . . .	2,023,012	4.7
30 " 200	118,981	6,741,000	Foundation . . .	385,987	0.1
200 " 1,000	13,757	14,240,000	Municipal property . . .	6,325,682	26.9
1,000 " 10,000	4,695	6,660,000	Ecclesiastical property . . .	1,183,612	2.0
Over 10,000	231	3,930,000	Fidei commissi (entail) . . .	463,382	0.2
			Private . . .	35,312,294	66.1

It will be seen from this table that only 6 per cent. of the proprietors in Hungary hold more than the amount of land which Major Craigie, in his recently-published "Return of Allotments and Small Holdings" (Parliamentary Paper C. 6144 of 1890), labels as the maximum limit in Great Britain of a "small holding," viz., 50 acres.

It would have been interesting if the corresponding returns for Austria could have been procured; but the only information that I am able to place against the Hungarian figures is a statement as to the average size of "peasant properties" in the different Cisleithan provinces. This I subjoin below, the

names being arranged in the order of the average size of the occupations :—

Average size in acres		Average size in acres	
Salzburg . . .	93 $\frac{3}{4}$	Styria . . .	28 $\frac{3}{4}$
Carinthia . . .	76 $\frac{1}{4}$	Moravia . . .	27 $\frac{1}{2}$
Dalmatia . . .	61 $\frac{1}{4}$	Lower Austria . . .	27 $\frac{1}{4}$
Tyrol and Vorarlberg . . .	52 $\frac{1}{2}$	Bukowina . . .	26 $\frac{1}{4}$
Carniola . . .	40	Upper Austria . . .	25
Coast-land . . .	37 $\frac{1}{4}$	Silesia . . .	18 $\frac{3}{4}$
Bohemia . . .	31 $\frac{1}{4}$	Galicia . . .	17 $\frac{1}{4}$

It will be seen from these figures that, in the Alpine districts of Austria, the average size of peasant properties is, on the whole, larger than in the other districts. This is due chiefly to the fact that the holdings include a good deal of not very productive woodland. In some parts of the country, where the woods are not State property, many peasant-proprietors own as much as from 1,500 to 2,000 acres a-piece, about 1,000 acres of all such properties being entirely woodland. In the mountainous districts, where intercommunication is difficult, these properties are generally compact holdings. In the lowland country they are often intersected by other estates, or are held in separate lots.

In those provinces where agriculture is most rational and most productive—viz., Bohemia, Moravia, and Silesia—a large part of the soil is in the hands of the large proprietors. The estates belonging to peasant proprietors form but a small proportion of these provinces, and the average extent of such estates is less than 30 acres. A very large number of the Bohemian peasantry possess only a small patch of garden-ground; and, as the produce of it is insufficient to support them, this class of the peasantry hire themselves out as agricultural labourers.

In the lowlands of Upper Austria small proprietors are the predominant class, the average size of a peasant property in these parts being from 40 to 60 acres. Many of these properties are, however, not less than 200 to 300 acres in extent. Similarly, in the lowland districts of Styria and Carniola the land is chiefly in the hands of small proprietors.

In Galicia, a property of 20 acres is considered sufficient to maintain a peasant family; and it will be seen from the statement that the average size of the holdings in that province is only 17 $\frac{1}{4}$ acres—the lowest on the list. Some peasants, however, only possess from 1 to 2 acres of land apiece; and these, like the same class in the northern provinces, maintain themselves and their families by the wages they earn as agricultural labourers.

THE MINISTRIES OF AGRICULTURE.

All questions connected with the land and its cultivation come under the cognisance of the central Ministries of Agriculture, the functions of which, as the chief agencies for agricultural improvements in the Empire, must now be described.

As in all other departments of State, except those for Foreign Affairs, War, and General Finances, there are separate Ministries of Agriculture for Austria and Hungary, at Vienna and Budapesth respectively.

The Austrian Ministry of Agriculture.

The first Ministry of Agriculture in Austria was established on November 19, 1849; but it was afterwards dissolved, and in 1853 its duties were transferred partly to the Ministry of the Interior, and partly to the Ministry of Finance. In 1861 the Ministry of Commerce was charged with the supervision of agricultural interests; but this only lasted till December 30, 1867, when an Imperial Rescript ordered the formation of a Ministry of Agriculture, with the object of "furthering the agricultural interests of the Empire." The duties of the new department were defined generally to be: "The superintendence of all matters relating to the different branches of the cultivation of the land, such as agriculture, forestry, viticulture, fruit and silk-culture, and the rearing of live-stock and bees; the regulation of agricultural and rural education; the supervision of agricultural societies and institutions; and the general superintendence of mines and mining regulations."¹

In the course of the first year of the existence of the Ministry, the control of the State Horse-breeding Establishment at Radautz was transferred to it from the Ministry of War.

On January 1, 1869, the superintendence of all matters connected with the chase, field police, and fisheries was also transferred from the Ministry of the Interior, which later in the same year parted with its control over the transfer and division of land to the new department. In 1872 further important additions were made to its duties by the transfer from the Ministry of Finance of the superintendence of the Crown forests, estates, and mines (except the saltworks—a very im-

¹ *Jahresbericht des K.K. Ackerbau-Ministeriums über die Massregeln und Arbeiten zur Förderung des Landescultur in den im Reichsrathe vertretenen Königreichen und Ländern für 1868* (page 3).

portant source of revenue), together with the management of various religious and educational endowments.

By these and other additions to its functions, the Ministry has become one of the most important of the Austrian Government offices, and the proper conduct of its business has necessitated its division into a presidential bureau, two sections and nine departments.¹

The Ministry is housed in a fine large building (which is its own property) in the Liebigstrasse, at Vienna, and according to the last returns had a staff of one Minister (His Excellency Count Julius Falkenhayn), who receives a salary of 20,000 florins (1,666*l.*)² a year; two chiefs of sections, each with a salary of 10,000 florins (833*l.*); five Ministerial councillors, four departmental councillors, seven secretaries, seven assistant secretaries, and four clerks. The Horse-breeding Department is supervised by a separate director (Field-Marshal Lieutenant Count von Graevenitz), who receives 9,804 florins (816*l.*) a year, and the Forest Department by a Ministerial Councillor, with engineers and inspectors under him. The total expenditure of the Department for Central Administration was, in 1889-90, 23,000*l.* Its other expenditure (omitting the outlay on Crown lands and forests and on mines, which was much more than balanced by the receipts) was as follows: -7,700*l.* for the State Agricultural Schools and Experimental Stations, 45,600*l.* for various subventions to agriculture (for general agricultural education, statistics, shows, societies, agricultural experiments, special cultivation, re-forestation, stock-breeding, and the like), 42,000*l.* to Improvement (Landescultur) Funds—i.e. funds under the control of the Provincial Diets, which the Minister subsidises—58,000*l.* for river-regulation and embankments in districts where inundations have occurred or are threatened, 3,000*l.* for the destruction of the phylloxera, 27,000*l.* for the expenses of inspecting and superintending the cultivation of the land, and 140,000*l.* for horse-breeding.

There is practically nothing in the way of revenue to set against this expenditure, except the receipts from the State Horse-breeding Establishments, which amount to about 36,000*l.*, and school-fees amounting to about 2,000*l.*; so that the net cost to the State of the Agricultural Department (excluding its Forest

¹ A re-arrangement of these Departments has lately taken place, and they are now not the same as reported in Parliamentary Paper No. C. 5865 of 1889. The particular method in which the Ministry distributes the business under its control is of no general importance; but the curious in such matters may be referred for a full description to the *Wiener Landwirthschaftliche Zeitung* of July 24, 1889, page 446.

² Throughout this paper the value of the Austrian florin in English money has, for the sake of convenience, been assumed to be 20*s.* (12 florins = 1*l.*).

and Mining Sections, as to which see pages 690, 691) may be stated in round figures at about 800,000*l.* a year.

A careful perusal of the published reports of the Ministry,¹ numerous conversations held with several of the leading officials and with outside authorities, and an inspection of the interesting and attractive pavilion of the Department in the grounds of the great Agricultural Exhibition of this year in the Prater, incline me to the belief that the Ministry is fully alive to the importance of its functions, and is doing its duty to the general satisfaction. Its encouragement of agricultural research, and its efforts in the cause of education, are, perhaps, those features of its work which have the greatest interest for us in England, and more detailed particulars of each of these sections are therefore given in the following pages.

But these subjects by no means exhaust the range of the Department's sympathies.² Under its present head, Count Falkenhayn, who has held office since 1879, the Ministry has taken an active part in social reforms. It has the control of the State mines (except salt-works), and in 1884 it obtained the concession of Sunday rest for miners, and the limitation of the hours of work for women and children. It has started and supported benevolent associations for helping the sick, paying funeral expenses, granting pensions, and the like. It has built public baths, erected labourers' dwellings, established soup-kitchens, and encouraged the formation of friendly societies amongst the miners. The funds of these societies existing at the State mines rose from 63,000*l.* in 1879, to 127,500*l.* in 1888.

The Ministry grants subsidies for the encouragement of all branches of agricultural production in every province. It supports agricultural shows, and takes measures against farm pests; it also makes grants for travelling. Its subsidies enable agricultural societies to purchase annually valuable seed in bulk, and to sell it in small quantities at moderate prices to small farmers. Fruit-growing is supported by establishing numerous nurseries for cultivating the most valuable and useful sorts.

¹ By the kindness of Herr von Blumfeld, the permanent head of the Department, I was enabled to bring home, for the Library of the Society, a complete set of these reports, which are portly volumes, giving full details of the work of each section during the period under consideration. Up to the present six reports have been issued, viz.:—(1) for 1868; (2) for the period from January 1, 1869, to June 30, 1874 (in two volumes); (3) from July 1, 1874, to June 30, 1875; (4) from July 1, 1875, to December 31, 1876; (5) from January 1, 1877, to December 31, 1880; (6) from January 1, 1881, to Dec. 31, 1886.

² For full details of the work accomplished by the Ministry during Count Falkenhayn's administration, see a series of six striking articles in the *Vienna Presse* of October 9 to 15, 1889, entitled "*Unser Ackerbauministerium (1879-1889).*"

Grants are given to associations for the purchase of appliances and implements for vine-culture. In 1889, 3,000*l.* were, as stated above, voted for the purpose of combating the phylloxera. Vines which are supposed to resist the attacks of this plague are cultivated for future distribution. In 1889, 216,000 vines were so distributed from the Government nursery vineyards. From 1880 to 1889, 31,000*l.* were expended in subsidies for reafforesting the Karst district. Help is also extended to other districts and societies, in order to encourage afforesting and the establishment of nurseries.

There are 2,016 stallions kept by the Government for improving the breed of horses. Twenty-six of the best stallions and 354 brood mares stand at the Government stud at Radautz, where there are in all 1,195 horses in the stables. To proprietors of approved stallions subsidies are given, in order that farmers may send their mares to such stallions at low rates—often not more than two florins (3*s.* 4*d.*). Interest in horse-breeding is further encouraged by giving race prizes and awards at Shows. The number of horses fit for military purposes has risen from 110,451 in 1879, to 319,385 in 1888.

Cattle-breeding is also encouraged by the purchase of good bulls of breeds suitable for the various districts, and the distribution of these over the districts according to a fixed plan, and also by the granting of prizes at shows. From 1880 to 1889 the sum of 70,000*l.* was expended in the improvement of cattle-breeding, exclusive of the considerable sums paid as subsidies to cattle shows and general exhibitions. In some provinces it has even been made obligatory on the parishes to keep bulls.

Legislative measures have been taken to stamp out cattle disease and prevent its importation. The compulsory insurance of cattle against certain infectious diseases has already been introduced in several provinces. The Ministry has taken in hand the publication of an elaborate work on the different breeds of Austrian cattle. This work is being written by the best authorities, and will soon be finished. Sheep, pigs, fish, poultry, and bees have all received a share of attention.

Special attention has been paid to ameliorations, more especially with regard to water-courses. Since 1884 the sum of 42,000*l.* yearly has been put at the disposal of the Ministry to subsidise works in this direction. The regulation of mountain streams has made considerable progress.

Much work is thrown on the Ministry in the administration of forests and domains belonging to the State and religious corporations, as well as by the administration of the State mines.

The Ministry at present manages 3,340,000 acres. Special attention is paid to a rational management of woods and forests. The annual revenue to the State from forests is about 350,000*l.*, and the expenditure 300,000*l.*

The State mines show a great development, and their profits have increased from 63,000*l.* in 1879, to 160,000*l.* in 1888. The output of coal increased during the same period from 84,721 to 395,582 tons; silver from 64,515 to 77,160 lbs.; copper from 1,038 to 6,428 cwts.; zinc from 6,092 to 24,736 cwts.; quicksilver from 7,512 to 9,616 cwt. The annual revenue to the State from mines is about 550,000*l.*, and the expenditure about 450,000*l.*

The Hungarian Ministry of Agriculture.

A Department for the supervision of agricultural matters in the Kingdom of Hungary was established at Buda-Pesth in 1869, but it was only last year that it was erected into a separate Ministry under Count Julius Szapary. Up to that time it had formed part of the Ministry of Industry and Commerce, from which it was formally separated by Government decree of June 15, 1889. The Ministry is divided into four chief sections: Forestry (with subsections for the Royal forests, general forest arrangements, forests under arable cultivation, forest inspection); horse-breeding; police (including rural police, veterinary matters, phylloxera, statistics); agriculture (including agricultural education, general agriculture, cattle-breeding); river and water regulation.¹

The Budget of the Department for 1891 gives the total expenses as 1,100,000*l.*, or an increase of nearly 50,000*l.* over the previous year. The chief items of this expenditure are: Central administration, 24,000*l.*; improvement of agriculture in different branches, 37,500*l.*; silkworm-culture (now exclusively in the hands of the Government), 55,000*l.*; agricultural educational establishments, 35,000*l.*; State forests, 350,000*l.*; forest inspection, &c., 13,000*l.*; State horse-breeding establishments, 300,000*l.*; veterinary establishments, 9,500*l.*; repression of cattle-disease, 13,000*l.* (since considerably increased); statistical bureau, 15,000*l.*

The two largest items in this Budget are for horse-breeding and for the State forests. The efforts made by the Government of Hungary for the improvement of horse-breeding are well known. The Kingdom has no less than four distinct State horse-breeding establishments—at Kisber (near Komorn), at

¹ *Wiener Landwirthschaftliche Zeitung*, No. 2,347, June 26, 1889.

Babolna (also near Komorn), at Mezőhegyes (between Szegedín and Arad), and Fogaras, in Transylvania. At these Haras there were, at the end of 1888, 508 horses at Kisber, 541 (Arabs) at Babolna, 1,755 at Mezőhegyes, and 402 at Fogaras.

The 2,346 Government stallions are during the season scattered at 795 stations all over the country, but at other times are collected at four depôts, as under: Stuhlweissenburg—in Hungarian, Székesfehérvár—(754), Nagy-Körös (747), Debreczin (545), and Sepsí-Szt-György (300). These depôts are supplied with their material from the Haras mentioned above. When this Department was taken over by the Ministry of Agriculture in 1869, there were 392 stations and 1,331 stallions; so that in less than twenty years the numbers have more than doubled. The fees for the service of the stallions, from 2 to 4 florins, appear to English minds ridiculously low.

It may be mentioned also here that the Government does something for cattle-breeding as well as horse-breeding. As throughout the country there is a deficiency of good bulls, the Government purchases a considerable number from the best herds for sale to the communes. In 1888, 174 Hungarian and 124 foreign bulls were purchased. With the view of still further encouraging cattle-breeding, the Ministry called upon the agricultural societies in that year to assist in the undertaking, and offered to add, as a subvention, a sum equivalent to that voted by the societies for the purchase and distribution of bulls, on the condition that the societies must purchase animals of the breed specified by the Government. This offer has already been accepted by many societies, and the system will probably receive further support. The Ministry has also taken pains to increase the stock herds, and the returns which are obtained from the sales of bulls and cows show very satisfactory results.

A Hungarian Herd Book was established four years ago, under a subvention from the Government, by the National Agricultural Society; and its object is to keep a clear register of the stock of pure-bred cattle, sheep, and pigs. At the end of 1888 137 herds, comprising 15,169 animals, were registered; and a popular edition was published, with instructions to proprietors how to keep their own lists. It is expected that this work will be of increasing utility to cattle-breeders and others.

With regard to the forests, the total area of the Hungarian forests amounts to considerably over 30,000 square miles. Of the total, $15\frac{1}{2}$ per cent. of the forests are State property, $23\frac{1}{2}$ per cent. property of municipalities and communes, $28\frac{1}{4}$ per cent. property of different foundations, Fidei Commissi, &c., and 33 per cent. private property. These last are not necessarily subject

to the regulations of management laid down by the Forest Authorities. According to the Forestry Law, the Ministry of Agriculture regulates not only the State forests, but also those belonging to communes, foundations, &c.; and in order to simplify the service, and to diminish the expenditure which would otherwise be thrown on the communes, the State has, in several instances, undertaken the care of communal and other forests. At the end of 1888 about two million acres of communal forests had come under the control of the State.

With the object of afforesting unwooded districts, over 29,000,000 young trees of different varieties were, between the years 1883 and 1887, distributed gratis to proprietors and communes; and in the year 1888 a further number of 10,910,000 were also given. The subordinate employés in the forestry service are trained in the State forestry schools, and for the post of foresters 440 individuals, including those who had passed through these schools, presented themselves for examination during 1888. The State continues to make purchases of forest; the most important in 1888 were the Szinenrer Forests, extending over 65,000 acres, and which were purchased for 67,000*l*.

Details of the work of agricultural education are given later, but it may be stated that a Director-General of all agricultural schools has been appointed; and travelling teachers for certain branches of agriculture have also been established. These travelling teachers are not so well organised as in Austria and France; and at present, in Hungary, they appear to have chiefly devoted themselves to giving instruction in vine-growing and agriculture.

A Department which is under the Ministry for Agriculture also deserves mention. In order to assist proprietors and cultivators in irrigation, drainage, and similar works on their lands, a body of engineers (*Kultur-Ingenieure*) was established some years ago. They prepare plans and estimates for works of improvement, &c., and also inspect the fisheries and watch over the proper execution of the law regarding water rights. It is considered that the services of these engineers would be more effective if their number were increased. The estimate for this branch appears in the Budget of 1890 as 8,500*l*.; in that of 1891 as over 9,000*l*.

AGRICULTURAL EDUCATION.

No section of the work of the two Ministries of Agriculture at Vienna and Buda-Pesth is more highly organised than that relating to agricultural education. As the subject of technical education is very much in the air at the present time in England

it may be useful to subjoin somewhat full details of the system which has been adopted in the two countries, and which, so far as can be seen, has been proved successful by the experience of twenty years.

Agricultural Education in Austria.

Just a century ago (in 1791) the first Chair of Agriculture was established in Austria, at the University of Prague, and in connection with it a farm-school was started at Trnawa, close by. Five years later Peter Jordan began, at the University of Vienna, his lectures on Rational Agriculture, which he continued until 1809, when he became Director of the Imperial estate at Vösendorf and Laxenburg. Bohemia seems to have been for a long period almost the only province that possessed agricultural schools; but after 1850 they became more general, and when the Austrian Ministry of Agriculture began its work in 1868, there were 35 in existence. Their subsequent development is most conveniently presented in the form of a table showing the numbers at intervals of five years¹:—

Year	Number of institutions	Of which there are supported by					Private persons	Attendance of pupils
		State	Provinces	Districts	Societies			
1870	36	2	12	2	18		2	1,075
1875	64	4	17	6	32		5	2,035
1880	65	4	26	2	31		2	2,441
1885	76	7	28	2	37		2	2,562
1890	103	6	31	3	61		2	3,075

The six establishments under the direct superintendence of the Government are the Hochschule für Bodencultur at Vienna (to which reference will be made later), the fruit-growing academy at Klosterneuburg (Lower Austria), three forestry schools at Gusswerk (Styria), Hall (Tyrol), and Bolechów (Galicia), and the botanic garden at Lemberg (Galicia).

Of the 103 schools in existence in 1890—

24 were in the Alpine and surrounding districts (viz., Lower Austria 11, Upper Austria 2, Tyrol 3, Styria 4, Carniola 3, and Carinthia 1).

61 in the North-West Districts (viz., Bohemia 40, Moravia 18, Silesia 3).

¹ For a very complete and interesting monograph on agricultural education in Austria, with full details as to the working of each school, see *Der land- und forstwirtschaftliche Unterricht in den im Reichsrathe vertretenen Königreichen und Ländern*, published by the Ministry of Agriculture this year (1890), and prepared by Baron Arthur von Hohenbruck, Ministerial Councillor, and Chev. F. von Zimmerauer, Under-Secretary of the Ministry.

14 in the North-East Districts (viz., Galicia 13, and the Bukowina 1).

4 in the Adriatic region.

Thus it will be seen that the two northern provinces of Bohemia and Moravia have more than half (58) of the total number of schools.

The schools may be divided into three great groups:—Either (1) the scholars are thoroughly instructed in the practice and theory of the whole subject of agriculture; or (2) they are so far instructed that they can superintend the labour of others; or (3) they are taught only enough to enable them to manage a small farm of their own by their own manual labour.

State Agricultural Academy at Vienna.—The first, or highest kind of teaching, is given at the Hochschule für Bodencultur at Vienna, founded in 1872, and now under the direct control of the Ministry of Public Instruction, which contributes annually over 10,000*l.* to its support. The teaching-staff consists of 18 professors, 19 lecturers, and 9 assistants, and the school has laboratories for agriculture, chemistry, technical chemistry, physiology, vegetable physiology, and anatomy, as well as a library, a museum, collections, and an experimental garden for forestry. There is an entrance fee of 8*s.*, and the lectures cost 2*l.* for each half-year, the use of the chemical laboratory being 8*s.*, and of the technical laboratory 16*s.* extra. There are 30 Government scholarships of the total value of 600*l.* which may be held by students. They range in value from 17*l.* to 25*l.*

Only those students are eligible for the Hochschule who have passed through the entire course at an ordinary middle school. In 1889 there were 246 students on the books, of whom 120 were studying agriculture, 112 forestry, and 14 agricultural technology. Students are at liberty to choose what lectures they wish to attend, and to prolong their studies as long as they like. There is, however, a plan of studies for each division comprising a three years' course of lectures. The students are required to pass several periodical examinations called "*Staatsprüfungen*" and after the conclusion of their triennial period of study, they may submit themselves to examination and gain a diploma. Those who pass the examinations successfully have the right to the title "*Diplomirter Landwirth*," or "*Diplomirter Forstwirth*," according as they have passed in agriculture or in forestry.

The course of study is severe, and the examinations are searching. To obtain a diploma in agriculture, the candidate must pass in mathematics, mechanics, physics; land-surveying; meteorology and climatology; inorganic, organic, and agricul-

tural chemistry; the morphology and physiology of plants; zoology; the morphology, physiology, and pathology of domesticated animals; the theory of breeding; mineralogy and geology; drainage and water supply; the growth of crops; statistics of cultivation; agricultural implements and machinery; book-keeping and farm-management; social economy; and general agricultural administration. All this, and much more, is included in the time-table for the three years during which the student remains at the school; and the practical work, that forms an indispensable part of the course, is also elaborately provided for.

Intermediate Schools (Mittelschulen).—Of these schools there are now 16, of which 12 are for agriculture, 3 for forestry (at Weisswasser, Bohemia; Eulenberg, Moravia; and Lemberg, Galicia), and 1 for fruit-growing (at Klosterneuburg, Lower Austria). None of the 12 agricultural middle schools are Government establishments, though they all receive subventions from the State. Eight are maintained by provinces, 1 (at Chrudim, Bohemia) by the district, and 3—at Mödling (Lower Austria), Kaaden (Bohemia), and Raudnitz (Bohemia)—are supported by societies.

The following statement gives the principal facts as to the eight provincial schools:—

Place	Province	When established	Language employed	Staff of teachers	Pupils
Tetschen-Liebwerd	Bohemia	1850	German	10	21
Tabor	"	1866	Czech	14	32
Neutitschein	Moravia	1875	German	9	53
Prerau	"	1875	Czech	9	46
Dublany	Galicia	1853	Polish	19	78
Czernichow	"	1860	Polish	12	45
Czernowitz	Bukowina	1871	German	10	36

The agricultural schools at Mödling, Tetschen, Tabor, Dublany, the three forestry schools, and the fruit-growing school at Klosterneuburg are called *Lehranstalten*, or colleges, the others being described as *Mittelschule*, or middle schools, though all the sixteen are grouped together in the official reports under the latter designation. The total number of teachers in these schools in 1890 was 138, with 573 pupils.

The aim of the colleges at Tetschen-Liebwerd and Tabor, as stated by Baron von Hohenbruck, is to impart "a higher scientific education in agriculture," and "the necessary knowledge in special branches." The course of lectures lasts two years. The college at Dublany aims at the "theoretical training of proprietors, tenant-farmers, and bailiffs." The course of lectures here extends over three years.

All the other intermediate agricultural schools—viz., those at Mödling, Chrudim, Kaaden, Raudnitz, Neutitschein, Prerau, Oberhermsdorf, Czernichow, and Czernowitz—are organised according to one fixed plan. Pupils before entering must have attended and have passed the four lower classes of an ordinary middle school. The aim of these intermediate schools is the training of pupils for the practical calling of farm-managers. The course of teaching is spread over three years, and comprises (1) languages, literature, history, geography; (2) natural sciences; (3) the different branches of agricultural science. Natural science collections, laboratories, models, plans, and maps serve to illustrate the lectures. Farms are not considered indispensable in connection with these schools, but they have nearly all their experimental fields and gardens. After completion of the three years' course, the pupils undergo a final examination and receive a certificate.

The object of the intermediate schools of forestry is to train pupils to be practical foresters. Residents are required to have attended certain classes (4 to 6) of an ordinary middle school, and to have had at least one year's practical training. The course lasts two years, and includes lectures on natural science and subjects in connection with forestry.

At the school of vine and fruit culture at Klosterneuburg, there is a two years' course of lectures, demonstrations, practical exercises, and excursions. Besides regular pupils, "visitors" who attend for a half-yearly term only, and "guests" who stay for a still shorter period, are admitted.

The fees at the intermediate schools range from 3*l.* 10*s.* per annum to 9*l.* and upwards. There are scholarships and boarding arrangements at all, or nearly all, of them.

Lower Schools (Ackerbauschule).—The third kind of education is given at 86 lower schools, which are again divided into general and special schools, as follows:—

29 general agricultural, and 27 farming winter schools, with (in 1890) 329 teachers and 1,394 pupils. (The winter schools have been found especially useful in Bohemia and Moravia.)

5 dairying and housekeeping (Haushaltung) schools, with 28 teachers and 116 pupils.

5 forest schools, with 15 teachers and 112 pupils.

16 garden, orchard, vineyard, and hop schools, with 73 teachers and 303 pupils.

4 brewery and distillery schools, with 26 teachers and 128 pupils.

The lower schools of agriculture are intended for sons of peasants who have attended primary schools, and their object is

to impart sufficient theoretical and practical knowledge to enable the students to farm their own holdings, or to act as bailiffs, farmers, and the like. The number of pupils is in some cases limited. The course is one of two years, and lessons are given on general subjects, natural science, and agricultural subjects, with demonstrations, practical exercises, excursions, &c. The schools are expected to possess collections, illustrations, models, implements, maps, and a library. Pupils must be 16 years of age, and must have passed an elementary school (Volkschule).

The so-called winter schools consist of courses of lectures given during the winter months to youths who have passed a primary school. The course comprises in most cases two winter terms.

The course of the dairy and housekeeping schools for girls is from six to twelve months. The object of the schools is to give daughters of peasants opportunities of gaining knowledge and skill in the management of a frugal household. Pupils must be 16 (in two schools 14) years of age.

For the lower schools of forestry, pupils must have passed a public school. The course lasts one year, both theoretical and practical lessons being given.

The lower schools of horticulture, fruit-, vine- and hop-growing differ widely in their organisation according to the particular purpose they are intended to serve.

The object of the brewing and distillery schools is to give theoretical and practical lessons in these important industries, accompanied by chemico-technical exercises and experiments. Pupils must have gained a practical knowledge of the industries in question before entering.

With many of the special schools boarding establishments are connected. The annual cost of maintenance in these appears to vary from 7*l.* 10*s.* to 25*l.* A number of schools have farms attached to them, others have experimental fields and gardens only. The number of pupils varies in the several schools from 10 to 50. At the majority there are scholarships open to the pupils.

Other Educational Efforts.—In addition to the instruction given at intermediate and lower agricultural schools, the Ministry of Agriculture organises special courses of lessons in general agriculture, fruit-culture, viticulture, dairying, veterinary medicine, horse-shoeing, and other special subjects. In 1889 there were 162 such courses, as against 125 in 1888 and 109 in 1887, and the number of pupils was calculated at 10,000.

The Ministry of Public Instruction also does something for primary agricultural education, in addition to supporting the Hochschule at Vienna. There were in 1889 9 chairs of agriculture in 5 polytechnic schools, and 11 schools and 22 courses of veterinary medicine and horse-shoeing. Lessons in agriculture were given in 1888 in 42 training colleges to 2,893 pupil-teachers.

The Ministry of Agriculture has, moreover, a staff of 19 permanent lecturers, who perambulate the country giving lectures and having conferences on farming and forestry questions with agriculturists who are unable to attend schools. Lectures of the same kind were given in 1888 by 161 other persons under the auspices of the Ministry, so that in all 180 Wanderlehrer—travelling teachers—gave in that year 1,967 lectures on general agriculture, 262 on fruit and vine culture, and 560 on other special subjects—or 2,789 in all—to upwards of 100,000 auditors.

It may be added by way of conclusion that the teachers both in the lower and intermediate schools are required to pass an examination, examining boards for which exist at Vienna, Prague, and Lemberg. For the discussion of questions relating to agricultural education the Ministry of Agriculture has started a paper, *Land- und forstwirtschaftliche Unterrichts-Zeitung*.

The total expenses of agricultural education not covered by fees was as follows in 1889 :—

	For Establish- ment of Schools	For their Maintenance
To the State	£2,200	£12,900
To Provinces	2,400	31,400
To Private Individuals	500	4,300
Total, £5,100	£51,600	

or a total of 56,700*l.*, excluding the cost of the Hochschule at Vienna, which is borne upon the estimates of the Ministry of Public Instruction.

The total net cost to date of the agricultural schools established in Austria is 1,124,000*l.* of which 187,000*l.* is for the Academy at Vienna. Omitting this, as under the control of another Department, Baron von Hohenbruck gives the total cost of Agricultural Education since 1868 as 987,000*l.*, of which 242,000*l.* is for the founding of the schools and 695,000*l.* for maintenance. The State has borne 33·5 per cent. (or 81,000*l.*) of the total cost of establishment and 24 per cent. (or 170,000*l.*) of the maintenance; the provinces 47·5 per cent. and 64 per cent.; and societies and others 19 per cent. and 12 per cent.

Agricultural Education in Hungary.

Just about the time that the first Chair of Agriculture was being established in Austria, Count George Festetics founded at Keszthely the once famous "Georgicon," an institution for the higher and lower education of agriculturists, foresters, gardeners, &c.¹ The "Georgicon" continued its operations until the revolutionary year of 1848, when it was suppressed: to be restored, however, in a modified form in 1865, when an agitation, inspired by the Hungarian Agricultural Society at Buda-Pesth, had sprung up for an agricultural school at which the teaching should be in the Magyar tongue.

Passing over certain other schools of more or less local interest and uncertain duration, the next to be established in order of time was the Agricultural Institute at Altenburg, founded by Duke Albert Casimir von Sachsen-Tetschen in 1818.

The Academy at Altenburg.—This has gone through the customary stages of Hungarian educational establishments. After the revolution, it was taken over by the Austrian Government in 1850, and the teaching was in the German language. When Hungary was granted a constitution, it was transferred to the charge of the Hungarian Ministry of Agriculture in 1869, and parallel courses of instruction were given both in German and Hungarian. Since 1884 instruction has been given in the Magyar tongue only, as a part of the general attempt of Hungarian patriots to revive their ancient, historic, but to foreigners quite hopeless language.

In 1874, when a general reform of agricultural education took place, Altenburg was erected into an Academy (*Königl. ungarische landwirtschaftliche Akademie*), and it is in fact the Agricultural University for Hungary. Students desirous of joining it have (since 1874) been required to show that they have passed through the entire course of a high school and have had one year's practical training. Since its original establishment in 1818, 41,165 students have passed through its courses, and at the date of the last report (1888-9) 105 were then on the books. The teaching staff consists of a director (salary 210*l.*, residence, and a percentage on the students' fees), seven ordinary and 1 extraordinary professors (salary about 170*l.*), three assistants (62*l.*), a farm-manager (120*l.* and residence), and his assistant.

¹ See *Der Landwirthschaftliche Fachunterricht im Königreich Ungarn im Jahre 1889*. Published by Ludwig Czetz, Altenburg, 1890.

The course of study extends over two years, the school-year being from October 1 to July 1. The fees for lectures are about 7*l.* a year; but there are eight scholarships of 12*l.* 10*s.* each which may be won by students.

A farm (of 465 acres) is an integral part of the establishment; a meteorological station was also established in 1860, a trial station for agricultural implements in 1869, an experimental station in 1873, and a seed-testing station in 1874. The total expenses for 1889 were 5,000*l.*, and the income was 2,330*l.*

Middle Schools.—There are four intermediate schools (Landwirthschaftliche Lehranstalten)—at Keszthely, already referred to as re-established in 1865; Debreczen (established 1868); Kolozs-Monostor (established 1869); and Kaschau (established 1875). The pupils at these schools must be 16 years of age, and must have passed a high school up to a certain standard. The course of studies is three years, and is both practical and theoretical. The fees are about 4*l.* yearly, and there are six Government scholarships at each school of the value of 12*l.* 10*s.* The directors receive about 170*l.* and residence, and the professors 120*l.* Farms are attached to all the schools, and there are also experiment, seed-testing, and meteorological stations. As specialities, there are at Keszthely fruit and hop gardens; at Debreczen fruit gardens and osier-beds; at Kolozs-Monostor, a veterinary hospital (which treated 106 animals in 1888-9), the making of "Monostor" cheese from sheep's milk, fruit gardens, vineyards, and fish culture; and at Kaschau, vineyards, a botanical garden, and a distillery, which produced in 1888-9 (principally from potatoes) 120 imperial gallons of spirits. At the last three schools boarders are taken. At Debreczen, pupils attending the first year's course are boarded and lodged at the farm, for which they pay 18*l.* At Kolozs-Monostor there is a boarding establishment for 46 pupils, 26 of whom pay nothing, and the remainder pay 20 florins (less than 2*l.*) a month. At Kaschau, students pay for full board and lodging 20 florins a month.

Lower Schools.—In addition to the above, there are seven lower agricultural schools (Ackerbauschulen) established and maintained by the State. These are divided into two groups: (a) for training farm-labourers and foremen, the teaching being chiefly practical; and (b) for training managers of small farms. Pupils must be 17 years of age, healthy and strong, and must be able to read, write, and reckon. They are bound to do the work to which they are put; and they receive board and lodging at the school, for which 12*l.* 10*s.* is payable. Part of this, however, the pupil is able to earn by his own labour. The course extends over two years, and there are no fees for teaching.

There are schools of the first class at Ada, Zsitva-Ujfalu, and Szent-Imre, and of the second class at Debreczen, Rimaszonbat, Csakovar, Nagy-Szent-Miklos, which last has been in existence since 1786, over a century ago.

The following statement¹ shows the number of schools and students at these schools, at intervals of five years since they came under the control of the Hungarian Government:—

Year	Academy at Altenburg	Middle schools		Lower schools		Total	
		No. of schools	No. of pupils	No. of schools	No. of pupils	No. of schools	No. of pupils
1867-8	140	1	104	1	17	3	261
1872-3	168	3	183	3	65	7	416
1877-8	203	4	269	2	62	7	534
1882-3	213	4	337	2	65	7	615
1887-8	105	4	388	7	202	12	695

The total number of scholars at these schools was thus 695 in 1887-8, as against 729 in 1886-7, and 711 in 1885-6. In the previous year's official summary it was mentioned also that there were 284 pupils at the Buda-Pesth Veterinary College (established in 1787), and 366 at the Academy of Mining and Forestry at Schemnitz (founded in 1807).

In addition to the seven agricultural lower schools maintained by the State, there are four for vine-culture and one for forestry. There are also three schools receiving Government grants—at Istvantelek (established 1875, and under the control of the Hungarian Agricultural Society), and at Besztercze and Földvár. These two last are in Transylvania, where also is another school (at Medgyes) which receives no subvention.

The total expense to the Hungarian Government for Agricultural Education is given in the last Budget as 36,250*l*. Next year this will be rather increased than diminished.

AGRICULTURAL EXPERIMENTAL STATIONS.

Experimental Stations in Austria.

Closely allied to the question of agricultural education is that of the scientific study of agricultural problems in the field and in the laboratory. An interesting report² lately issued by the Austrian Government shows that there are now 11 agricultural experimental stations in that country: of which

¹ *Mittheilungen des kön. ung. Ministeriums für Ackerbau, Industrie und Handel*, V. Jahrgang, 1889, pp. 533 *et seq.*, pp. 849 *et seq.*, and pp. 976 *et seq.*

² *Das land- und forstwirtschaftliche Versuchswesen in den im Reichsrathe vertretenen Königreichen und Ländern*, Wien, 1890, pp. 113.

four (one for general agriculture at Vienna, one for silkworm and vine culture at Görz, one for vine and fruit culture at Klosterneuburg near Vienna, and one for forestry at Mariabrunn, also near Vienna) were founded and are maintained by the Government. Three others are supported by the Imperial and Royal Agricultural Society at Vienna, and the Provincial Agricultural Councils for Bohemia at Prague, and for Vorarlberg at Feldkirch. There are also four special and more or less private establishments maintained by the Austro-Hungarian Sugar-Producers' Union at Vienna, by a Brewers' Association for brewing and malting, also at Vienna, by the Distillers' Union at Prague, and by Prince Schwarzenberg at Lobositz for the benefit of his own estates. In addition to the above, there are experimental stations at the following provincially supported agricultural schools: San Michele (Tyrol), Parenzo (Istria), Neutitschein (Moravia), Prerau (Moravia), Hermsdorf (Silesia), Dublany (Galicia) and Kaaden (Bohemia). Next year (1891) further experimental stations are to be established at Czernichow (Galicia) and Ritzlhof (Upper Austria) for the testing of seeds and manures. Nor must mention be omitted here of the Society for the Advancement of Agricultural Experiments, which, though it has no station of its own, organises a great variety of valuable experiments on the estates of its members.

Whilst in England the work of agricultural experimental stations is almost uniformly devoted to what may be termed field and feeding experiments, all very much of the same type, and all carried out on lines laid down by practical agriculturists, that of the Austrian stations is of a much more varied nature. The comparative trials of manures in the field, or the feeding of materials to sheep and oxen in the stall, are supplemented, for instance, by the selection of the best seeds and plants, or by investigations into the physiological development, &c., of the beasts, as the case may be. Again, analytical examination of manures, feeding-stuffs, and seeds, is not only placed within easy reach of the farmer, but the manufacturer and merchant also are permitted to utilise the stations for the same purposes. These latter privileges have been attended by very great success, and the manufacturers prefer in the majority of cases that the goods in warehouse shall be branded on the outside of the cases or bags with the guaranteed quality, as defined by the analysis. It is satisfactory to notice that farmers now make it the practice to buy only with a very definite guarantee, the vendor being obliged either to make good any deficiency in quality of the goods delivered, or to take the whole back again at his own expense. In the case of analyses made for manufacturers and merchants,

it would appear that such reports are not for use as advertisements, but rather for determining the value of goods actually in warehouse.

In addition to this work, instruction is given at most of the stations to a limited number of students, who combine with their studies such work as will be of assistance to the station. Qualified men are also sent from some of the stations to the various country towns, where they deliver courses of lectures, and give practical instruction wherever possible.

The Imperial Agricultural Experimental Station at Vienna.—This, which is by far the most important of all the stations, merits some detailed description. It was founded by the Government in 1870 for the following objects:—

- (a) Scientific researches with regard to animal and vegetable production.
- (b) Investigations in connection with the practice of agriculture, e.g., on the laws of acclimatisation of plants and animals, on the value of new cultivated plants, on the cultivation of plants which are used in commerce and in medicine; on the manuring of permanent pastures, on dairying, &c.
- (c) Control of artificial manures.
- (d) Examination and application of mineral manures.
- (e) Analytical, physiological, and microscopic examinations for the Ministry of Agriculture, or (at fixed fees) for societies or private individuals.
- (f) Dissemination of the results of the investigations by means of lectures and publications; training of agricultural surveyors; generally, offering advice and guidance.

The station has since developed into one of the most important institutions of the kind. The work is carried on in three directions—viz., scientific researches, examinations of agricultural and technical products, and education. Of special importance are the investigations with regard to animal physiology, manuring experiments, and the nutritive value and preservation of human food. The physiological experiments are made with the aid of Pettenkofer's respiration apparatus. Feeding experiments have lately been made with horses, calves, sheep, pigs, rabbits, ducks, and pigeons, with a view to ascertain the nutritive value and digestibility of mixtures of forage and also of new and suspicious feeding-stuffs. Experiments are also made on various mixed foods, on the smut of wheat, on saccharine, on manures; on the cultivation of new fodder-plants, such as green sorghum (*Sorghum saccharatum*), prickly comfrey (*Symphytum aspernum*), the soja or soy bean (*Soja hispida*), and caper-spurge (*Euphorbia lathyris*); on ensilage, and on other matters.

No experimental fields are attached to this station, it being the practice to carry out the field experiments on the farms of

private individuals. For this purpose no lack of offers from men both qualified and willing to execute the work according to the instructions of the director of the station has been experienced.

The growth of the analytical work done for boards, societies, and private individuals will be best seen by a glance at the following Table:—

	1870	No. of samples examined		
		1877	1884	1889
Manures and soils	38	216	1,157	1,504
Products of agriculture, such as dairy produce, feeding-stuffs, &c. }	40	71	1,580	2,081
Allied manufactures: sugar and starch, waters, steam-producers, oils, &c. }	3	135	927	1,595
Fermented products from spirit distilling, brewing, and wine }	—	669	661	750
Government sugar determinations .	—	—	3,713	6,250
Totals	81	1,091	8,038	12,180
Total amount of fees . £20	£20	£285	£1,145	£2,060

The fees charged are low; one half of them are paid over to the Government, while of the other half the director (Dr. Meissl) receives two-fifths, and the analyst three-fifths, in addition to their salaries. The expenses of maintaining the station, which varied from 800*l.* to 2,500*l.* a year, had to be almost wholly met by the Ministry of Agriculture until 1877, for the receipts were up to that time little or nothing. Subsequently the institution became almost self-supporting. In the year 1889 the outlay amounted to 2,400*l.*, of which as much as 2,060*l.* was returned in the form of fees for analysis.

Government Stations at Görz, Klosterneuburg, and Mariabrunn.—The station at Görz, which was the first to be established (in 1868), has achieved considerable success in the rearing of silkworms and in combating their maladies. The number of microscopic examinations during the last decade has reached the high figure of 160,000. At the station for vine-culture at Klosterneuburg important work has been done with regard to the production, composition, and adulteration of wines; and the forestry station at Mariabrunn, in addition to scientific researches, organises and supervises the practical experiments with regard to silviculture made in the different provinces of the Empire.

Seed Control Station at Vienna.—The seed control station of the Imperial and Royal Agricultural Society of Vienna, which is one of the six stations founded and chiefly maintained

by societies, was established in 1881, under the directorship of Professor von Liebenberg. The work of the station is almost exclusively the examination of seeds. This privilege is extended not only to farmers, but also to seedsmen, and the samples are drawn in warehouse from the bulk by officers of the station, after which the quality, as determined by the examination, is branded on the bags. It is also customary, when any sale is effected, to draw a sample in the presence of two witnesses, and if, on examination, it proves to be under the guarantee, the seller must either make good the deficiency or else take the goods back at his own expense.

In addition to the seed-testing, a large number of botanical investigations are carried out for the purposes of scientific research. The analyses include the botanical separation of seeds and grasses, the examination of barleys as to their malting properties, and the examination of hops. The station possesses collections of the seeds of forage-plants, cereals, and of the plants of commerce and forests, as well as of pure and adulterated feeding-stuffs, and of the most important weeds and wild flowers.

The following table shows the rapid development of the work:—

	No. of samples received		
	1881	1885	1889
Samples sent for analysis	207	800	2,266
Botanical investigations	423	1,045	4,486
Samples drawn from bulk, the sacks being branded with the results of the analyses	278	1,458	3,945

This station has always received Government assistance. At first this took the form of a guarantee against deficit in expenditure to the amount of 700 florins per annum, which was increased in 1882 to 800 florins, and to 1,000 florins in 1889. Since then the Government has promised a contribution of 1,000 florins for the present year, and 1,500 florins (= 125*l.*) for the three following years.

The Austrian Agricultural Experiments Society.—As has been already stated, Austria does not possess any agricultural experimental station for field experiments, as the so-called “experimental stations” described above are simply highly developed and well conducted laboratories for the skilled analysis of manures, feeding-stuffs, and seeds. But this deficiency is to a large extent met by the Society for the Progress of Agricultural Experiments in Austria, founded in 1885 by the Chevalier Em. de Proskowetz, Junior, of Kwassitz, who has since acted as the

Society's President, whilst Professor von Liebenberg is the Secretary.

This Society receives no financial assistance from the State or from municipalities, but is wholly supported by the contributions of its members. It is in fact a quite private and independent association of men who seek to advance agriculture by carrying out, in the best and most scientific way, comparative field experiments on various points of farming practice. The results of these experiments, which are carried out in spring or autumn according to a carefully elaborated systematic programme fixed beforehand at the Society's general meeting, and controlled by chemical analysis (made in the laboratory of Professor Schwachhöfer of the Vienna Academy of Agriculture), are recorded in the very interesting and detailed Annual Reports of the Society (*Mittheilungen des Vereines zur Förderung des landwirthschaftlichen Versuchswesens in Oesterreich*).¹

The fees of the members are 300 fls. (=25*l.*) life membership, or 35 fls. a year for "foundation members," and 10 fls. a year for ordinary members. The number of foundation members, among whom are the Emperor and the Archduke William, is now twenty. The number of ordinary members, among which appear the agricultural schools of Budweis and Reichenberg, Mödling, Neutitschein, Hermsdorf, Kaschau, Mediasch (Transylvania), as well as the State horse-breeding establishment at Radautz, is 114. During the first four years of the Society's existence, 328 reports on experiments successfully carried out have been received and published.

The influence of this young and promising Society is undoubtedly already considerable, and gives promise of almost indefinite increase. It has achieved its success mainly by the energetic efforts of its President—who bears a name highly honoured in Moravia, and who is one of the three distinguished sons of a distinguished father—and of its Secretary, who, as Professor of Agriculture at the Vienna Academy, holds a position second to none amongst agricultural scientists in the empire. I had the pleasure of meeting both Chev. Em. von Proskowetz, Jun., and Dr. von Liebenberg at the International Agricultural Congress at Vienna, and came away greatly impressed with the high value of their work and the great power for usefulness of the Society of which they are the pillars.

¹ These reports are published by Frick, Vienna; and the following have already appeared: 1886 (price 1 fl. 50. kr.), 1887, 1888, 1889 and 1890 (price 3 fls. each volume).

Experimental Stations in Hungary.

The experimental stations (such as they are) in Hungary appear to be exclusively at the agricultural schools. The records of the operations of these stations, as contained in their last reports, do not afford material for useful comment. But it may be mentioned that at the Agricultural Academy at Altenburg there is a trial station for agricultural implements (where in 1887-8 experiments were made with maize-cultivators, steam threshing machines, grubbers, sowing machines, potato planters, and the like), a chemical experiment station (where in 1887-8 124 analyses were made of artificial manures, foods, wine, wheat, &c.), a seed-testing establishment, and a meteorological station.

AGRICULTURAL SOCIETIES.

In addition to the direct work of the Government, the advancement of agriculture is fostered in each province, either by provincial agricultural committees or boards, or by central societies receiving subventions from the Government or from the Provincial Diets. Under these, again, are district, local, or branch societies, associations, and clubs, of which in 1886 there were 1361, of which 372 were special. The total number of members of these various associations is estimated at 100,000, of which nearly half are in Bohemia.

In five of the provinces—Bohemia, Upper Austria, Tyrol, Istria, and Dalmatia—the central societies which formerly existed have been replaced by provincial agricultural committees or boards (*Landesculturrath*). Each of these committees consists of a member of the Provincial Council, who is chosen by the Emperor, as president; certain experienced officials; the leading men of the local agricultural unions; and members nominated by the Ministry of Agriculture and the Provincial Councils for six years, and by the various societies for three years. The other provinces still retain their independent central societies.

The oldest of the central societies in point of date of formation is the Agricultural Society of Carinthia, at Klagenfurt, founded in 1764, which is closely followed by that of Carniola, at Laibach, founded in 1767, and that of Moravia, at Brünn, founded by Maria Theresa in 1770. The *locale* of the Moravian society has since the year 1818 been in the old Bishop's Palace—a most interesting old house, now filled with antiquarian treasures dug up at Brünn (which was a Roman settlement) and a very complete collection of the fauna of the province.

In a place of honour in the hall is the original (now worm-eaten) wooden plough with which the Emperor Joseph II. about a hundred years ago ploughed a field with his own Imperial hands to show his sympathy with agriculture. The exact spot is indicated by a monument in bronze erected at Slawikowitz, which is passed on the railway journey from Bränn to Wischau. I may perhaps be allowed to chronicle here with some pride my election, after my visit to Bränn, as a Corresponding Member of this ancient and distinguished Society, the full title of which is "*K. K. Mährisch-Schlesische Gesellschaft für Ackerbau-Natur- und Landeskunde.*"

A considerable period elapsed before any other provincial societies were founded. In 1812 the Imperial and Royal Agricultural Society at Vienna, now perhaps the most important of all, was formed for Lower Austria; and this was followed by the society for Styria in 1819; for Galicia in 1845; for Salzburg in 1848; for Bukowina in 1852; for Vorarlberg in 1861; and for Silesia in 1865.

These societies nominate their own officials and committees, without interference from the Government; but they all receive subventions, and in the majority of provinces there is also a central forestry society. The subventions take the form of money prizes and medals at agricultural shows, and grants for public improvements (such as river embankments, drainage, water-supply, &c.), agricultural experiments, special cultivations, planting of trees, improvements in the breeding of cattle and other live-stock, silk-culture, and the like, adapted to the needs of each province.

The particulars given above are, as already mentioned, summarised from a great variety of official publications and copious notes of interviews made at the time of my visit; and as they have been revised in proof by those chiefly concerned, it is hoped that they comprehend all essential facts as to the agricultural administration of Austria-Hungary. The actual practice of agriculture in the Empire will form the subject of a further article, to be published in the next volume of the Journal.

ERNEST CLARKE.

CROPS FOR PICKLING AND PRESERVING.

FARMERS are constantly being advised to grow special crops, now that those on which they have relied for generations no longer prove as profitable as might be desired; and market-garden crops are continually referred to as likely to prove remunerative.

Undoubtedly those cultivators who gardened their farms in years gone by made good profits, but the advice to place a portion of the land under garden cropping has been followed to such an extent that sensationally high prices are much rarer than they were; whilst it is the few rather than the many who are reaping large returns by growing what are known as coarse vegetables, and these have usually some special market or method of disposing of the produce. There is, moreover, an enormous increase in the quantity of vegetables imported, and this has acted as a heavy handicap upon the English grower. Foreign importations are felt the more severely because almost all these vegetables are grown in milder climates, and are placed on the English market before those grown in the open-air in England are ready. As those which come into the market first realise the higher prices, the English-grown produce is only sold when prices are moderate, so that the extreme rates which were relied upon to meet the expense of the special methods necessary for the production of these crops are not realised, and the profitable nature of the business is much diminished.

At the same time it must be remembered that the population has increased, and that each individual eats more vegetables than formerly; nevertheless, there is truth in the saying that it is easier to grow vegetables than to sell them. The relation of the pickling interest to the production and consumption of green vegetables is much closer than might at first sight appear; indeed, from the grower's point of view, they are almost inseparable. Most of the crops that are pickled are also used as vegetables, and in some seasons it may pay better to sell them for immediate consumption than for pickling purposes. Some portions of such crops, again, may not be suitable for pickling, whilst quite unobjectionable as vegetables. Thus, in those districts where pickling is practised, the pickling and gardening interests cannot, as a whole, be conveniently separated.

The increased attention paid to the growth of vegetables has made the business more precarious—it was always speculative—and the prices realised are sometimes far from remunera-

tive. Hence the additional outlet obtained by utilising a portion of the growth for conversion into pickles is a decided advantage, and the extra business which results is a welcome addition to the possibilities within reach of the tiller of the land.

The demand for pickles is of course not unlimited, but a considerable quantity is required both for home and foreign consumption. The consumption outside Britain is very great, especially in the Colonies, where a large amount of meat is eaten, and where even in the case of the poorer classes meat is almost always accompanied by pickles. At home the demand for tinned meats, preserved fruits, and pickles has largely increased in the rural districts, prejudices which existed till within a few years ago having largely disappeared. As wages increase, meat will be more generally eaten by the poorer classes, and it may fairly be assumed that pickles will be required with the meat. With the prospect of a larger population throughout the world, and higher wages for the labourer, the demand for pickles seems likely to become greater rather than less. Already a large quantity of vegetables adapted to pickling are grown abroad and imported; but the greater part of the pickling is done at home, because female labour, which is particularly suitable for much of the light work connected with the process, is plentiful and cheap.

Two kinds of pickling are practised. In the one case the vegetables are at once prepared and put into vinegar. In the other case they are "brined" for some time, before being converted into the form in which they are eaten. There is, indeed, a third class, in which the vegetables are preserved without the use of vinegar. The chief products which are pickled directly are red cabbages, radish pods, nasturtiums, beet, kidney-bean pods, tomatoes, and walnuts. Those which are previously placed in brine are onions, cauliflowers, cucumbers, gherkins, and vegetable marrows. Shelled peas are tinned to be used as vegetables, no vinegar being employed.

Subjoined is a botanical classification of the plants named:—

Name	Systematic name	Natural order	Part of plant used
Cabbage	<i>Brassica oleracea</i>	Cruciferae	Leaves
Cauliflower	"	"	Inflorescence
Radish	<i>Raphanus sativus</i>	"	Fruit (a jointed pod)
Nasturtium (or Indian Cress)	<i>Tropaeolum majus</i>	Geraniaceae	"
Scarlet Runner	<i>Phaseolus multiflorus</i>	Leguminosae	" (a pod)
French Bean	" <i>vulgaris</i>	"	" "
Pea	<i>Pisum sativum</i>	"	" "
Cucumber, gherkin (or gherkin)	<i>Cucumis sativus</i>	Cucurbitaceae	" (a berry)
Vegetable marrow	<i>Cucurbita ovifera</i>	"	" "
Tomato (or love apple)	<i>Lycopersicon esculentum</i>	Solanaceae	" "
Beet	<i>Beta vulgaris</i>	Chenopodiaceae	Root
Walnut	<i>Juglans regia</i>	Juglandaceae	Fruit
Onion	<i>Allium Cepa</i>	Liliaceae	Stem (a bulb)

The systems of growing these crops, as regards rotation and manuring, are (1) as market-garden crops, (2) as market-garden-farming crops: the former do not include cereals, the latter do. Land upon which garden crops are grown requires to be very heavily manured, as everything is taken off; and the high rents and large amount of labour required necessitate the raising of big crops. As, therefore, the land is kept in good heart it is not necessary to adhere to strict rotation, so that if there is a prospect of a particular crop proving more than ordinarily profitable it can be repeated. A typical rotation on a market-garden farm on light land would run somewhat as follows:—(1) Scarlet-runner beans grown for seed; (2) cucumbers, the land being dunged; (3) onions, the land again being dunged; (4) turnips grown for seed, the land being heavily dressed with soot; (5) wheat.

This would be a simple five-course system not involving catch-crops, which, however, are often inserted after certain crops in rotation; as, for instance, cauliflower, after early pickling onions, to be gathered in the autumn of the same year in which the onions were taken off in July. Peas, either for pickling or grown as selections from the leading seed-merchants, often form a considerable part of the cropping, and potatoes are always an important crop.

It is impossible, in discussing pickle-farming in connection with market-garden farming, not to recur frequently to Messrs. King and Sons, of Broom, near Biggleswade, Bedfordshire, for they are the largest and most successful growers engaged in this industry, and are generally considered the most skilful. Last year Messrs. King kindly allowed me to take from their books many valuable and instructive details. They farm in all some 1,100 acres, of which about 200 acres are grass, the whole of the arable land being devoted to the growing of special crops. The land rests chiefly on the greensand and alluvial gravel, and is throughout a light loam, with nothing except its good natural drainage to specially recommend it. It is only able to sustain the system of heavy cropping by the immense quantity of manure put on it. A portion of the land, having been taken in hand as recently as the last two or three years, is hardly yet in condition for the purpose; still a very good idea of the way in which the land is cropped may be gathered from the following details of cropping in 1889:—

	Acres		Acres
Potatoes	120	Cucumbers, big ones for sale,	
Turnip seed	110	small ones and gherkins for	
Onions and onion seed	90	pickling	20
Cauliflowers for pickling	50	Peas, selected varieties	60

	Acres		Acres
Radish seed	30	Clover, seed and feed	20
Beans, kidney and French, for seed	25	Swede turnips, feed	40
Pickling cabbages	20	Carrots, feed	5
Mangel seed	40	Sweet pea seed	1½
Wheat	120	Artichoke seed	1½
Barley	80	Lavender	½
		Mangel, feed	5

Garden crops were grown to a larger extent this year, as Messrs. King had got a portion of their newly taken land in suitable condition. To keep the land in condition for carrying such exhausting crops, Messrs. King annually purchase 2,000 tons of London dung, 4,500 sacks of soot, and 30 tons of dissolved bones—this is in addition to the large amount of dung obtained from the live stock, of which 1,300 sheep were fattened off in 1888, besides 150 heavy beasts, and 120 big hogs. These consumed bran which cost 119*l.*, pollards 167*l.*, oats and barley 59*l.*, cake 652*l.*, beans and peas 784*l.*, straw and hay 205*l.*: a total of 2521*l.* The labour bill exceeds 7,000*l.* per annum; railway bill 1,800*l.*; rates 500*l.* As Messrs. King have built up this successful business, and as they are generally regarded in the trade as among the most capable of those engaged in the growth of many of the crops to be discussed in this paper; there is no need to apologise for frequently referring to their methods.

Bedfordshire is now almost the only district in which brining is practised, for since Messrs. Circuit's business in Essex was closed, the trade has drifted to the first-named county. Nevertheless, the whole of the crops pickled or brined there are not grown in the neighbourhood, although by far the greater part are. No district possesses a better record, both past and present, than some of the land around Sandy and Biggleswade, which still holds a leading place, although it has been devoted to special crops for a great number of years. In Batchelor's "Agriculture of Bedfordshire," published by the Board of Agriculture in 1807, the author mentions that Sir John Sinclair told him, in answer to questions, that

Gardening has been carried on at Sandy from time immemorial, but increases considerably. The rent is supposed to be from 2*l.* 10*s.* to 3*l.* The articles principally produced are green pease and beans, cucumbers, potatoes, parsnips, carrots, radishes, cabbage-plants, and turnips, which are sent to markets in all directions to the distance of sixty miles, and perhaps further.

Onions are not enumerated in the foregoing list, but that they were grown is shown by the following:—

I am informed that at Biggleswade a field manured and cleaned has been let for one year to grow potatoes and onions for 5*l.* or 6*l.* per acre.

And again :—

The practice of sowing onions in drills 6 inches wide is used successfully.

It will thus be seen that suitable land may be gardened for an indefinite time, provided sufficient manure is applied and proper methods are adopted.

As representing the system of growing garden and pickling crops in market-gardens, the following rotation given me by Mr. W. Cooper, of Willow Hill, Morhanger, Beds., whose father is one of the most successful men in the business, may be of interest :—(1) Early peas, after which the land is broken up and seed-beds for producing cabbage-plants are sown ; (2) either cucumbers, kidney beans, or early potatoes ; (3) vegetable marrows, with rye or onions (for seed) as shelter. Some growers crop with kidney beans and early potatoes on the same land for years. Mr. Cooper, who is a briner as well as a grower, works his land on the market-garden-farming system, the following being an illustration of his treatment when getting ordinary land into fit condition for his purpose :—(1) Potatoes, manured with 100 bushels of soot per acre ; (2) cauliflowers, manured with 30 tons of rotten London dung ; (3) oats manured with 100 bushels of soot ; (4) onions manured with 40 tons of rotten London dung. When the land is worked round into condition, he prefers to take onions before cauliflowers.

The systems of cropping hitherto mentioned do not include the quick succession of catch-crops ; illustrated, for example, in the growing of two crops at one time on the same land, which is not infrequent. Thus, onion seed and parsley seed are often mixed together and sown at one time. The onion crop is on the ground six months or so, and is then pulled ; the parsley is not injured by this, but after a hoeing, to keep down the weeds, grows rapidly, and is gathered through autumn and winter. Cauliflowers, Brussels sprouts, Savoy cabbages, and other green crops are frequently planted among the small-topped varieties of early and second-early potatoes, so that when the potatoes are dug the land is still carrying a crop well on its way to maturity. Three crops are sometimes on the ground at once, the mixed seed being sown thus : radishes, carrots, and parsley. The radishes quickly become fit for pulling, and in this way make room for the carrots, which are pulled and bunched throughout summer. The ground is then left to the parsley, which, being of slow growth in its early stages, does not require much space until it has been on the land some months, though it begins to grow rapidly when once well established.

Additional instances might be quoted, but this is not neces-

sary, as it has only been deemed desirable to indicate the connection between the different croppings before proceeding to discuss the various crops individually.

CROPS FOR BRINING AND PICKLING.

Onions.—This is the most important crop grown for pickling purposes. Messrs. King grew 130 acres of onions this year, which will average from 10 to 12 tons per acre, it being a very productive season. Light, friable soils with open subsoils are best suited to their growth, and the greatest care has to be taken in preparing the seed-beds. The previous treatment of land for growing this crop is by no means confined to the few months immediately preceding the sowing, for it requires to be got thoroughly into condition, both as regards manuring and cleanliness. Certain conditions are decidedly unfavourable to the growth of onions. Land which has been cropped with common field-beans rarely produces good onions, for the latter are then liable to “gloat” or puff, in which case they are useless for pickling, as the bulb is too soft. Besides this, onions so grown are much more liable to attacks of the onion-grub, as this insect appears to harbour in the straw, or haulm, during some period of its existence, though it has not been actually traced. It not only appears more often on land on which beans have been grown, but when bean-straw is used as litter from which dung is made, and the dung is applied for onions, a serious attack is almost certain to ensue. Therefore the cropping has to be arranged so that onions do not follow beans, either directly or after some years, and most onion-growers refrain altogether from cultivating beans.

Although heavy dressings of rotten dung are often applied a few months before onion-seed is sown, it is preferred to put on a considerable quantity in the preceding years, and thereby to get it thoroughly incorporated with the soil, so that its rankness may be dissipated through the medium of other crops. Last spring I saw Messrs. King getting a piece of land on their new farm into condition for onions, but the onions will not be sown for at least another year or two. The land was in wheat stubble which had been autumn-cultivated and cleaned; it had already received 100 bushels of soot per acre; 25 tons per acre of good London dung were at the time being applied, and after this there would be a dressing of 7 cwt. of dissolved bones. All these were being put on to produce a crop of swedes which would be fed off by big wether sheep, receiving as much cake as they could consume. A crop of peas will be sown in the following spring. If, after

the peas, the land seems to be in favourable condition for onions the latter will be sown, but the land will even then receive 40 or more tons of dung per acre.

In a well-known book on gardening, from which quotations are frequently made, it is stated that a *poor* soil is necessary for producing the small firm bulbs required for pickling. This is distinctly wrong, for the land should be made exceedingly rich, and the size of the onion controlled by thick seeding. The manurial dressing previously mentioned, as followed by Mr. Cooper, is by no means excessive, and occasionally the application of dung may amount to 60 tons per acre. This is, of course, very expensive, as London dung, fifty miles out, costs 5s. 9d. per ton at the station, to which has to be added the cost of carting and applying to the land.

In connection with London dung, it is worth noting that onions to which saw-dust dung is applied are much more liable to attacks of wire-worm than are those for which straw-dung is used. Where the presence of wire-worm is suspected, it is usual to grow a crop of mustard, and to dress the land with gas-lime before sowing the onion seed; this is generally found sufficient to check the pest. If the land is in such good heart, from previous manuring, that dung is not considered necessary, 100 bushels of soot are almost invariably sown during winter, while the land lies in the furrow.

Freedom from weeds is such an important matter that, where market-garden-farming is practised, the stubbles are never used as sheep-runs, but the land is broadshared or skimmed immediately after harvest to prevent seeding; or the land is at once broken up to be made into a seed-bed for immediate sowing. The cost of cleaning onions is so great that, even under favourable circumstances, it rarely amounts to less than 5l. per acre, from 4l. to 5l. 10s. being the usual range of prices. Mr. King once pointed out to me a field which he said cost 20l. for weeding the first time he grew onions on it, but which, owing to thorough cleaning and the prevention of weeds from seeding, cost only 30s. an acre the last time he took onions upon it.

In ordinary cases the land is broken up as soon as the previous crop is out of the way, and any filth is at once cleared off. It is allowed to lie through winter, and dung is carted on when there is sufficient frost, but the land is not disturbed until a favourable opportunity occurs early in the new year. It is then worked most thoroughly, and brought down to a fine but solid tilth. An onion tilth cannot be too fine, as the seed germinates more thoroughly and more evenly the finer the soil. As it will not germinate if sown too deeply, a rough surface would result

in some portion of the seed being over-buried, if the rest were put in at a proper depth. Nevertheless, after finely reducing the soil, it must be solidified, but not worked when wet, or it will become packed, which is injurious.

The seed is generally sown broadcast for growing "picklers," as the onions are better distributed about the ground, and each plant gets a fairer share of space than when placed in drill-rows. After seeding it is harrowed in with light harrows or raked in with iron hand-rakes and, if occasion demands it, rolled as well; the subsequent workings consist of hand hoeings and weedings. The quantity of seed sown is generally from 60 lb. to 80 lb. per acre, but if its germinating power is low as much as $1\frac{1}{2}$ cwt. has been used. The appearance of the field when the onions are about 4 inches high is not unlike that of newly laid down grass-land when viewed at a short distance, so thick do the young plants stand. There is no thinning, all the plants being allowed to mature. The seed varies in price very much, the usual quotation being from 1s. 6d. to 10s., though it has been as much as 20s. per lb. The cost of the seed is thus a very serious item, and the growth of seed is a most important part of the onion grower's business, which must be briefly noticed.

The usual method is to grow the seed from bulbs placed in rows about 2 feet apart, though a considerable quantity is grown in rows much farther apart when used for providing shelter for cucumbers. Strong land grows the best seed, although light, friable soils are most suitable for growing bulbs. Well-shaped onions are selected, and are transplanted in February in rows, about 3 tons per acre being required for planting a full crop. These, as a rule, will come to seed fit for gathering in September. The whole crop does not ripen at once, but as the seed-heads are fit they are cut and collected, and placed on cloths to dry.

The method of drying the heads so that the seed will thresh out freely is somewhat tedious. The heads are placed on cloths resting on straw and spread out during the day, but before night or rain they are raked up into the middle of the cloth. Above the cloths hurdles are set up like an inverted V, and the ends of the cloths are turned up over them. The straw which thereby becomes exposed is gathered up, and placed on the top of the ridge-formed by the hurdles. When the heads are dry enough, they are threshed by means of the flail. In very windy weather, loss often arises through the seed being blown off the cloth, where if any seed falls out of the heads it is collected.

As onion-bulbs are worth from 3l. to 10l. per ton, and sometimes even more, seed-growing is very expensive. Unfortunately

the crop is very subject to destruction by mildew (*Peronospora Schleideniana*). This fungoid disease, which also attacks the young onions, generally appears in cold wet weather in July. The young plants are not, as a rule, destroyed, though in bad cases they make no further growth; a very severe attack on the pipes or stems which carry the seed-heads may result in the loss of the whole of the seed. In the years 1888 and 1889, the seed crops were most seriously injured, nine-tenths of some being absolutely killed; while very few crops suffered loss to the extent of less than one-third. Seed was therefore dear, and there was a large demand for that of foreign growth, which, though often very good, cannot be relied upon. The Russian seed is commonly to all appearances perfect, but it is not infrequently useless for pickling purposes because the bulbs grown from it split like chestnuts, having some resemblance to shallots, which are objected to in the trade merely on account of their shape. I saw a field of 14 acres, which—regarded casually—appeared to be perfect; but when the onions were skinned for pickling they were found, from the cause mentioned, to be useless, and the owner calculated that he had lost 1,000%. This was not his first experience of serious loss from this cause. The best seed for the purpose in view is the English-grown Spanish onion as a main crop, though the Silver-skin is occasionally cultivated for producing specially early bulbs, in order that a start may be made with the brining in good time.

To return to the pickle crop, which was described as being sown. The hand-weeding commences as soon as the onions are well up, this work being done chiefly by women and children, who go down upon their hands and knees and carefully pick out or cut out every weed. No top dressings are applied, as artificial manures are not popular; nitrate of soda and other nitrogenous manures are found to cause an excessive growth of neck and a soft bulb, producing what are called "romps," that is, onions of rampant growth, which are altogether unsuitable for pickling purposes. Farmyard manure is the fertiliser most preferred, as it retains the moisture in dry seasons and keeps the soil open in wet ones. Soot is the market-gardener's favourite concentrated manure.

The onions for pickling are hoed up with either the hand-hoe or the horse-hoe; when they are loosened they are collected by hand into rows. It is best to take them away and peel them at once, but this is not always practicable.

Onion-bulbs are liable to two diseases—one is known as "mouldy nose," and attacks the nose or root end either before or after pulling; but is generally caused by excessive wet: when once thus attacked the bulbs are spoiled for pickling.

The other disease, known as "stale rot," attacks the crown after pulling, and whilst the bulbs are stored, so that it is not discovered until they are handled.

The operations of peeling and brining are not generally understood, but as they enter into the pickle-grower's business they may be briefly described.

The onions are brought to sheds, and are there sifted with the object of removing the bulbs which are too big for pickling, and also to clean them to some extent. The suitable ones are then handed over to women or children, whose duty it is to cut off the tops and bottoms, and to peel off the outer skins until the bulbs are free from deeply coloured portions. These after being inspected are thrown into a large tub of fresh water and washed, after which they are placed on sieves and separated into different sizes. In all, five sizes are made up: the smallest are the most valuable and are called "pimps," while the others grade as firsts, seconds, thirds, and fourths, the last named, rather more than an inch in diameter, being the largest which are received in the trade. The onions are next placed in water and well washed, after which they are put into separate barrels, and when the barrels will hold no more a strong brine is poured into them, and they are coopered up. The work, so far as the briner is concerned, is now finished, except that from time to time it is necessary to fill up the barrels with brine, as loss arises from evaporation, and also from shrinkage of the onion itself. The process of brining is necessary to destroy what is known as the "vegetable" in the onion, that is, the green colouring, which the brine does in course of time. Some manufacturers will not use onions until they have been in brine at least a year. It is very largely due to the circumstance that they are not brined that home-made pickles are not so bright and clear as those made by large firms. The quality of the water is an important factor, for, if it is too hard and the onions are left in it for a day or two, they become black.

As showing what a quantity may be grown on one farm, it may be mentioned that in 1889 Messrs. King brined 4,000 casks, which were the produce of about 90 acres; this year they grew 130 acres, and the yield is much greater per acre. In addition to this, they will brine something like 1,000 barrels of cauliflowers and about 400 to 500 barrels of cucumbers and gherkins, all the produce of their farms. Others interested in pickling and brining grow their own material, besides occasionally purchasing from smaller growers. During the past few years considerable quantities of pickling onions have been imported from Russia and other countries where labour is cheap. Though it is to the interest of the English farmer not to allow

others to step in, the grave difficulty of labour is, one which market-gardeners must look forward to with even greater anxiety than ordinary farmers, as so much of their work has necessarily to be done by hand. Their greatest safeguard against foreign competitors appears to be in the employment of women and children. Messrs. King for some months during the pickling season employ as many as 1,000 hands, the greater number of whom come from neighbouring towns and villages; but men are required for all the heavier kinds of work.

Cauliflowers.—The extent of land on which cauliflowers can be successfully grown is very considerable, as, by suitable manuring and management, good crops may be obtained on light loams, fen loams, and even on strong loams. Cauliflowers have the family characteristics of the cabbages in adapting themselves to circumstances very readily, and in being but rarely injured by insects. Hence they are met with in many districts, and, as vegetables, are placed on the market at almost all seasons, because, by taking advantage of different climates, they can be made to come to maturity at all times. Cornwall is the earliest district to send them into the market, but the Channel Islands and France also send them in early, and secure the best prices. These do not affect the pickling trade, as it is those which mature in summer and autumn that are chiefly used for brining.

The plants are invariably grown in small seed-beds, and transplanted when a fitting opportunity occurs. Those grown for pickling are sown in beds in the early spring, about 10lb. of seed being required per acre. The seed-bed should be made on a finely prepared tilth. Deep cultivation is not desirable, as it has a tendency to make the roots penetrate to a considerable depth, whereas it is much preferable to keep them near the surface, as they are then not only easier to pull, but there is adhering to the stem a mass of fine fibrous rootlets which help the plants to strike quickly when they are moved. It is a good plan to distribute a heavy dressing of superphosphate on the surface at the time the seed is sown and to harrow all in together, for nothing keeps the rootlets near the top so well.

Cauliflowers may be grown after various crops, for, as has been stated, strict rotation is not adhered to in gardening. For early gathering, land which has carried a crop of onions in the previous year is in high favour, as it is generally rich and clean, but after onions 100 bushels of soot are applied. The land is got into suitable condition, and the plants are usually set 2 feet to 3 feet square apart. It is advisable to have well-

grown plants, as they make the fastest growth, but large plants require more careful setting than smaller ones. The main root should be cut off, so that the rootlets may strike near the surface as much as possible, and in all transplanting it is necessary to prevent the root from turning up in the dibble-hole. Another common way of growing cauliflowers is to plant them between rows of early small-topped potatoes, which are dug early and sold "green." The plants then get a good root-hold before the potatoes are dug, and time is economised; the soil from the ridges is turned back on them, and with a little horse-hoeing a good growing tilth is prepared. It is an approved plan with all varieties of cabbages to drop a little nitrate of soda round each plant very soon after transplanting, as a more vigorous start is thereby promoted: cauliflowers are no exception to this rule. Cauliflowers are also successfully planted out on land which has carried an early crop of pickling onions taken off at the end of June or the beginning of July. By putting in large plants at that time, the heads are ready for cutting in October, and the custom is in favour with briners.

When the heads are fit to cut, men are sent into the crop daily, and pick out those which are ready and suitable, whilst others, not sufficiently grown, are left to mature. Firm heads are essential for pickling, and these, as soon as cut, are at once taken away to be brined.

The preparation for brining consists in cutting off all stemmy and green portions, so that nothing but the white coral-like part of the head is left; this, of course, results in a large amount of offal, which is usually carted away and consumed by sheep on pastures, so that it is not wasted. The yield of clean heads varies very much, from one to five tons per acre of prepared heads being grown, though five tons is not common. The process of brining is practically the same as for onions.

Cucumbers, Gherkins, and Vegetable Marrows.—The fruit of the cucumber and vegetable marrow is pickled to a considerable extent. Large cucumbers are usually sliced, small ones are picked out and sold as gherkins; and vegetable marrows—though this is not generally known—are pickled and substituted for cucumbers when the crop of the latter fails.

Cucumber-growing in the open air is not so profitable as it was, owing to the more extended cultivation under glass. Open-air cucumbers are not so good as those raised beneath glass, but the field cucumbers are the only ones employed for pickling. The Dutch cucumbers, grown in both Holland and Belgium, are also strong competitors in the vegetable market, and very

fine ones may be purchased in September at 1s. 2d. per dozen. English field-grown cucumbers generally fetch about 3d. to 3½d. per dozen, whereas, before the days of glass and importation, say ten years since, they used to command 2s. per dozen. As the market for the primer quality is lost, the crop is not so popular as it was.

Cucumbers are a particularly risky crop to grow, as they suffer much from cold and from insect and fungoid attacks. On account of their susceptibility to cold, it is necessary to provide shelter in open fields. For this purpose thick rows of rye or onion seed are sown in parallel lines, and the cucumbers are planted between them. Occasionally kidney-beans are grown as shelter. The land has therefore to be worked in the autumn, and the rye is sown in rows ranging from 4 feet to 10 feet apart, according to the variety of cucumber to be cultivated. When onion seed is grown to provide shelter, the rows are usually planted 4 feet to 5 feet apart. About 18 cwt. of onion-seeds are required per acre; these are planted out in January or February, so as to be well grown by the time they are needed as shelter. Onion seed grown in this way generally yields more in proportion than when it is cultivated as a whole crop with the rows closer together, and from 6 to 12 cwt. of seed per acre is considered an average crop.

The land must be in rich condition for cucumbers, and worked to a fine tilth, and towards the latter end of April or the beginning of May the first seed should be planted. The favourite varieties in the field are the Stockwood Ridge and the Pershore Long Ridge. About ¾ lb. of seed is required to plant an acre, and this is dibbled in, but it rarely happens that a full plant is obtained without filling up. In fact, it is no uncommon occurrence to have to plant the whole ground three or four times in one season. As the cost of seed varies from 14s. to 21s. per lb., this is a very heavy item.

Young plants are extremely liable to injury by frost, and are subject to attacks of wire-worm. A small brown ten-legged grub frequently destroys the crop by attacking the roots. The green fly is also very injurious and attacks the head of the vine in any stage of its growth, preventing further progress. No means are taken to combat the attack beyond occasionally picking off the heads. Mildew is a very serious disease, and appears, after flowering, from the end of July to the middle of August. The plants turn yellow, and if the attack is severe they do little good.

Towards the middle of September the plant goes down, and picking comes to an end about the beginning of October. The

crop is a most uncertain one, even if it runs the gauntlet of the attacks just mentioned, and the yield is difficult to determine; but a good result would be 80 barrels per acre, the barrel weighing about $3\frac{1}{2}$ cwt. When disposing of the produce the larger cucumbers are picked and sold for consumption as vegetables. The "chumps" (coarsely shaped cucumbers) and seconds are brined and used for making into mixed pickles, being sliced after brining. The smallest and neatest shaped ones are picked to be sold as gherkins, but the quantity of gherkins brined in England is small, those specially grown for the purpose in France being much preferred. The brining is a very simple process, nothing being done beyond washing the cucumbers before putting them into brine.

Vegetable marrows are occasionally used for pickling at times when cucumbers are scarce, and they make very good substitutes. They are hardier than cucumbers, and the yield is very great. The market, however, is uncertain, and frequently they are quite unsaleable. In years of great scarcity of fruit they are used by manufacturers of inferior jams and marmalade to make syrup for jams, and this sometimes causes the price to be remunerative. The cultivation is practically the same as for cucumbers, the most popular varieties being the Long Yellow, the Bush Yellow, and the Bush Green. They are not uncommonly planted on dung-heaps and compost-heaps, where they grow immense crops; and they are all very useful for planting in odd corners and similar places not convenient for growing other crops. The small marrows are brined in the same manner as cucumbers.

No other vegetables are brined, but those that have been discussed are the ones that demand the greatest attention from the grower, as the other varieties are worked up by the pickle manufacturers, who get the whole of the profit of pickling, whereas the grower gets a portion of the profit of manufacturing on those which are brined by him.

CROPS FOR PICKLING.

Red Cabbages.—The next class to consider is that in which the vegetables are pickled without undergoing the process of brining. Of these, red cabbages are the most important.

The red cabbage is an extremely hardy plant, which can be grown on almost all soils, provided sufficient manure be applied. All cabbages are hungry feeders, and large quantities of nitrogenous manures can be put on with much advantage, and without risk of injury, for it is almost impossible to over-

manure them. Wherever ordinary cabbages can be grown, the red variety will do equally well, and the culture is practically the same. The seed is sown in August, and the plants are best transplanted in the autumn, either to a newly turned furrow or to a piece of autumn-tilled land. It is advisable to mark out the land first by crossing it with a marker-out, or with a drill set at the required width, and then crossing again at right angles. The plants are inserted where the lines intersect, and horse-hoeing can then be effected in both directions. This is a great advantage, as the horse-hoe does the best after-tillage, and largely relieves the hand-hoe, which should only be required to work immediately around the plants. The cabbages should not be less than 2 feet 6 inches apart, and if the land is in good heart, especially on sewage ground, which is particularly favourable to the crop, 3 feet or even more may be allowed, as the quality of the cabbages is very much in accordance with the size, the larger ones always commanding the higher prices.

Red cabbages are of two kinds—the Drumhead and the Ox-heart. The Oxheart is the more valuable for pickling, as it is darker in colour. The yield of cabbages varies very much, according to the amount of manure and moisture present, and ranges from 10 tons per acre on light, dry soils, to 40 tons on rich sewage land. The outer leaves are always stripped before the cabbages are sent away; and a cartload of red cabbages is heavier than a similar load of any other root or vegetable crop grown on the farm.

This crop was until recently a very profitable one; but English-grown "picklers" have been almost unsaleable in recent years, owing to the heavy importations from Belgium, which not only get into the consumers' hands earlier, but can be put on the London Market cheaper than is possible by rail, even from a less distance than fifty miles out of London. Scores of acres, of late years, have never been sold, or even offered for sale, as they would not bring home 10s. a ton; in fact, buyers could not be found at any price. There is one saving point, which is that they are the best of all cabbages for sheep-keep, although a prejudice exists on account of the colour. They are also good for cows; but if the outside leaves are allowed to decompose, however slightly, the milk is sure to be tainted. So much are they esteemed by market-garden farmers, that some grow them extensively as sheep-feed, without the slightest expectation of selling them for pickling.

Scarlet Runners and French Beans.—Although not extensively grown for pickling purposes, still considerable quantities of

beans are pickled, both for mixing and for selling separately. French beans are preferred for the purpose, as it is not desired to have them too large; but scarlet runners are employed when the supply is short. As only the smaller ones are of use, the chief means of disposal must be sought in the vegetable market. French beans, as compared with scarlet runners, are not extensively grown in England, as they are not so hardy and do not yield so well. A light, warm soil in good heart is necessary for the crop, and a finely-prepared tilth is essential. As they are very susceptible to frost, they cannot be sown early; in forward seasons the first seed may be planted about the middle of April, and the seeding continued until the middle of May. A fine tilth having been prepared, grooves are made with either a hoe or a hand plough; for French beans the grooves are 2 feet 6 inches apart; for scarlet runners, 3 feet apart. The seeds are dropped in the rows, those of the French beans being placed about 8 or 9 inches apart, and of the runners 1 foot apart; they are then covered with soil. It is usual to sow about 3 pecks of runner seeds per acre.

The French beans never require sticking; and in field-culture no support is given to the runners, as an endeavour is made to induce them to grow bushy, and they are dwarfed by having the top shoots nipped or cut off. Gathering commences in July, and continues until frost kills the plants in autumn. In favourable years 500 bushels of pods, weighing 32 lb. per bushel, are gathered per acre. They are sold at from 6d. to 3s. per bushel in the market; but there are heavy expenses, which, if they do not swallow up the whole of the market-price, are frequently so great that not more than a penny or twopence per bushel is brought home. Still, taking one time with another, they may be considered fairly profitable.

Radishes.—Another vegetable which is occasionally met with in the pickle-jar is the radish; but the seed-pod, and not the root, is the portion pickled. The crop is, therefore, a seed crop, of which a portion of the pods may be picked for pickling, if there is a demand for them. Hence it is immaterial whether the turnip-radish or the long radish is grown. The soil required is of the usual market-garden type, free, well-drained, and in high condition. It is not necessary to discuss the growth of radish roots, as their cultivation is distinct from that of the seed. In order that the pods may form there must be ample space for the branches to spread; and the seed is sown in the early part of May, in rows 2 feet apart, the surplus plants being struck out with a hoe, as in ordinary root-cultivation. Rarely,

if ever, is the whole crop grown exclusively for podding for pickling purposes, so that it is impossible to say what quantity of pods are grown per acre; but the average yield of seed is about 20 bushels per acre, and the pods are very large in proportion to the quantity of seed contained in them. The seed is difficult to thresh; and, all things considered, it is not a very popular crop.

Nasturtiums.—*Nasturtiums* are so commonly grown for the sake of their foliage and blossom that the value of the unripe fruits for salads or for pickling is frequently lost sight of. Whilst the blooms have been improved by selection, the seed has not suffered. Capers are considered a more suitable accompaniment to boiled mutton; but they are expensive, and comparatively out of reach of some people, who find pickled *nasturtiums* make a very palatable substitute. They are so common that they are rarely grown on a large scale; but as a poor man's pickle they are by no means to be despised. In some districts they are used in salads, or placed in slices between pieces of bread and butter, as sandwiches, and are highly esteemed. Any odd piece of land can be utilised for growing them; and as there are both giant and dwarf varieties, they can be selected to suit circumstances. If planted in the spring, the green fruits are fit to pick in the early autumn; but they should not be allowed to get too old.

Beet.—This is a product which is not pickled to a very great extent; but a considerable quantity is worked up, the greater part being done by housekeepers, instead of by large pickle-merchants, as is the case with most of the crops previously mentioned. The sale of beet is therefore effected in small quantities, as it is generally retailed from the markets, or dispensed by green-grocers. There is nothing strikingly different in the cultivation of beet and of mangel, except that beet must be planted closer together. The rows are drilled about 18 inches apart, and the plants are set out 6 to 8 inches apart in the rows. Perhaps beet may not be considered quite so much a crop of the heavier loams on which mangel will flourish; but on almost any land where there is a fair depth of soil, free from superabundant moisture, it may be easily grown. If the land is not clean, it is carefully forked in the autumn to remove couch, and then ploughed over to a good depth. Dung is generally applied in winter or spring, so that it may be well worked in during the tillages, in order to obtain the necessary tilth, the soil being in readiness for drilling by the beginning of May. About 11 lb. of seed are required

per acre. When the plants are big enough, they are singled, and are kept clean by hoeing throughout the summer. When the crop is lifted, which must be before there is danger of frost, the roots are not cleaned or trimmed, but stored, with the earth adhering, in clumps or heaps, and protected from frost by substantial coverings of straw and earth.

Tomatoes.—The great increase in the popularity of the tomato as an esculent has led to much attention being given to its growth during the last few years.

The attempts to grow tomatoes in the open air have not always proved successful, owing to the uncertainty of the English climate, which in average seasons is too cold, wet, or sunless to ripen the fruit. Occasionally, in hot years, like 1887, gratifying results are obtained, leading to the planting of increased quantities in the succeeding year, but too frequently with disappointing returns. Though the open-air cultivation of tomatoes is often recommended, yet it is doubtful if great success can be relied upon until some cheap method is discovered for preventing mildew. Marvellous results are occasionally obtained, and these are often taken as the basis of calculations as to the profit that may usually be relied upon; but my experience in special croppings has been that, as they have to meet limited markets, there shortly arrives a time when the margin of profit becomes very small, owing to competition.

As I wished to get reliable information as to the prospect of success likely to be obtained by growing tomatoes in the open, I asked Mr. George Monro, of Covent Garden, to give me the names of the most successful growers he knew. He mentioned Messrs. C. Steel & Son, of Ealing, and Mr. M. F. Watkinson, of Ealing Common, both in Middlesex. I accordingly wrote to them. In reply to several questions, Messrs. Steel kindly replied to the following effect:—They have grown tomatoes for twenty years in the open air, and their yearly cropping has been from 1 to 9 acres. The crop is taken in rotation with other crops. The plants are raised under glass, and planted out in the last week of May; but, except for the purpose of raising, none are grown under glass. Carter's Perfection and the Large Red have proved the most successful varieties. The tomato-disease appears to be very similar to the potato-disease. They consider that glass would be more profitable than open-air culture, and conclude by saying that the seasons these last few years have been, as a rule, so bad—although in 1887 they grew 10 tons per acre—that they think of giving up the practice altogether, and growing entirely under glass.

Mr. Watkinson agrees with the foregoing, for in his reply he says :—

I do not think tomatoes are worth growing as an open-air crop, without you can *make* fine weather for them.

I have known of several successful crops grown in the open air, but of a great many more which, owing to disease, or to lack of warmth to mature the fruit, have been unsuccessful. I am inclined, therefore, to think that tomatoes are not likely to prove a reliable crop unless the situation and local climate are very favourable.

The large importations of tomatoes, which have increased very much of late, keep the market constantly supplied, so that very high prices are not probable in the future. Still it must be admitted that the English-grown fruit is the choicest, and is likely to maintain its position as the best on the market. From January to May, before the English fruit is ready, there is a large supply from the Canary Islands. Jersey sends considerable consignments from May to the end of October, and from July to the end of the year large quantities arrive from Valencia, Bordeaux, Belgium, and Holland, those from the Netherlands being nearly equal to the fruit grown at home. Thus, throughout the year there is a steady supply.

Those cultivated under glass are, doubtless, the most profitable of the English-grown tomatoes, for they are under the control of the cultivator, and by good management can be relied upon to make a steady return. The expense of putting up glass is, however, a great consideration, and a hindrance to most people. The outlay on glazing is a very heavy one, and any means of lessening the cost of construction would doubtless be welcomed by gardeners. Mr. G. F. Strawson, of Newbury, the inventor of the ingenious machine which takes its name after him, has given much attention to this subject, and he recently showed me an original method of fastening glass, which he was using in his own houses. He has since told me that he has been so successful with the tomatoes grown in a house which he finished in May last that the cost of construction had been repaid by one season's produce. He has not quite perfected his plans, but will do so shortly, and will then make them public. I would strongly recommend those who are thinking of using glass for tomato-growing in the future to consult his report when it is published.

When tomatoes are planted in the open air, they should be first forced under glass, then hardened. It is absolutely necessary that the plants should be strong and well grown, so that they may be able to take the fullest advantage of the short

English summer, and arrive at maturity before the autumn frosts set in. At no stage of their growth can they withstand frost, so it is useless to plant them out before the end of May. The land must be highly manured, with the tilth most carefully prepared; and the plants should be set from 2 feet to 2 feet 6 inches square apart, and kept scrupulously clean. They are supported by strong stakes driven firmly into the ground. After the plants have grown to the required height, the tops and laterals must be kept back, so as to encourage the formation of blooms; and this nipping of the shoots must continue as long as the plants appear to need it. The yield is very variable, on account of the mildew, and varies from an almost total failure to 10 tons of fruit per acre. Of course, in situations where walls with favourable aspects can be utilised, some of the advantages of houses are obtained, and tomatoes do better than in strictly open places.

The mildew which attacks the leaves, and then the stems of the plants, and thus prevents flowering or fruiting, is, as previously stated, very similar to that which attacks the botanically-allied potato. The remedy announced for potato-disease should therefore prove as effective on tomatoes as on potatoes. A solution of blue vitriol, mixed with lime,¹ is applied, in the form of a spray, before the plants show signs of attack; and the dressing must be repeated whenever the weather is humid, or in any way seems likely to promote the disease.

A point in favour of growing tomatoes in the open air is that they make most excellent pickles; and those who are not fortunate enough to be able to ripen the fruit, would do well to pay attention to this method of utilising them. They must be unripe for pickling purposes, as it is necessary that they should be hard. No other vegetable grown in England appears to be capable of conversion into so many kinds of sauce as the tomato, and many of them are very simple to make. Thus another convenient means of disposing of the produce which has not ripened sufficiently to be consumed as fruit is afforded.

Many varieties are before the public, but perhaps the most popular for open-air culture are Carter's Perfection and Sutton's Maincrop. Carter's Red and Yellow Currant Tomatoes are well adapted for pickling.

Walnuts.—Pickled walnuts are so distinct in character from any other pickles, and are so highly esteemed, that there is always a steady market for them.

¹ This is the *bouillie bordelaise* ("Bordeaux stirabout"), used as a fungicide by French cultivators. The proportions are 6 lb. of lime, 6 lb. of sulphate of copper (blue vitriol, bluestone), and 10 gallons of water.—ED.

Walnut-trees are almost always planted singly, or in very small clumps, and rarely on any recognised plan. Hence an account of a case in which they were planted on a definite system may not be without interest. In 1831, Sir William Long planted a field of some 6 or 7 acres in extent with walnuts; it is said, because he had an idea that walnut-wood was likely to become scarce, and would, when arrived at maturity, be in great request for gun-stocks. He calculated that while the wood was maturing the land would pay its way by means of the fruit. The field is, naturally, a rich loam resting on gravel, at Kempston, near Bedford. Several varieties of walnuts were selected, and the trees, 365 in all, were planted "on the square," 21 yards apart. So they remained until some fourteen years ago, when about two-thirds of them were cut down, as it was found they were too close to flourish. In order that the land should not be out of profit while the trees were making no return, it was planted with hops—some of the last grown in Bedfordshire—and they stood for about ten or a dozen years, when they were stocked up and the land seeded down to grass, in which it still remains. At present the trunks measure from 3 to 5 feet in circumference at 4 feet from the ground, and from the ground to the fork 14 feet. Since the trees began to bear they have averaged about 2,000 nuts per tree; whilst the biggest yield, in 1870, was 5,000 per tree. Of course, as yet, the trees have but little felling value; but this they will acquire as time progresses. Meanwhile, the grass and the nuts are making a fair return per acre; so that, like much other fruit-planting, this has not been a bad investment, though the ultimate return is still a long way off.

Pickling offers an additional opportunity for disposing of the fruit. In very fruitful years the quality of the nut is improved by thinning; and as the fruits for pickling must be small, and not old enough to have a shell inside them, it is altogether expedient to pickle a portion of the immature fruit.

CROPS FOR PRESERVING.

Peas.—Green peas, when shelled, are preserved in tins in such a way as to retain to a considerable extent their original flavour. This mode of preservation is, of course, not pickling; for, after particular treatment, the peas are packed in tins or cans, and kept good by the exclusion of air, and not by the presence of vinegar. This business might well be extended, for comparatively few housekeepers are aware what a valuable addition canned peas make to the vegetables available for winter consumption, although in hotels they are largely consumed.

There is an old saying that "a good crop of peas has often been the ruin of a farmer." By this is meant that, when a good crop of peas is grown, it proves so remunerative that the farmer is inclined to grow a larger quantity in future; but it is such an uncertain crop, that years may elapse before he grows another profitable one. Among the risks which have to be run, the worst is the damage done by the green fly, which attacks the shoots at the top of the haulm, and sucks out the nutritive juices, so that the pods cease to form, and those already formed do not fill. Another is the mildew, which attacks the whole plant, and is known as the blight, for the crop is either partially or wholly ruined. Hail, again, is sometimes very destructive. There is, moreover, the risk during harvesting: for in wet seasons it is a very awkward crop to gather in, and the peas may either germinate in the pods, or shell out during the frequent turnings necessary to dry them; or they may be carted too soon, and rot in the stack. All but the last-named of these risks apply when the crop is grown for picking; but the last is, of course, of less importance then, although there are generally a certain number of pods not gathered which have to run the risk. The haulm, or straw, is well worth careful harvesting, it being the most valuable straw we have for feeding purposes, especially for milking-cows, as it imparts a more nutty flavour and a better colour to butter than any other food used in winter feeding.

The green-pea crop is grown very largely by market-garden farmers; but the earlier varieties for picking are, perhaps, chiefly grown by market-gardeners. So far as peas for gathering for preserving are concerned, it is not important that the earliest varieties should be grown, as the aim is to obtain a heavy yield, rather than to get them into market early; the heavy-yielding varieties are therefore chosen.

In selecting varieties, it is necessary to favour those which are best suited to the soil naturally, and also to the same soil under different conditions of cleanliness. I have found that, among the shorter-strawed varieties, none of those commonly grown are superior in all points to the Dr. Maclean, a pea of the Champion of England type, of which the Fillbasket is also a good representative. All of these generally find favour with the London market-gardeners. Among other medium-length varieties, Veitch's Perfection is a hardy sort, with very strong laterals, and is a good yielder. Lye's Favourite is also found very prolific. Daniels's Matchless Marrow, the Telegraph, and the Telephone, are among the most useful of the longer-strawed kinds. Of the longest-strawed sorts, the Ne Plus Ultra is very reliable; as is also the British Queen, which is much of the

same type, as well as the Tall Mammoth, which has proved itself very productive. Many other varieties might be mentioned; but after considerable experience I find those named to be among the most reliable varieties as main croppers. Short-strawed varieties should never be grown on weedy land.

Peas grown as a main-crop require richer soil than the earlier sorts, and the land should, therefore, be got into good heart by manuring, the dung having been put on in time to be well worked into the soil. Although in market-gardens they often follow a crop of winter greens, which necessitates the land being freshly stirred, it is generally admitted that peas do best on a stale tilth. A well-prepared tilth is required, and this must be in readiness for drilling by the beginning of April; it is not necessary to put the peas in before then, whilst, by waiting, the risk from frost is avoided. In field-culture, from 3 to 4 bushels of peas are drilled per acre, and they are sown in rows from 1 to 2 feet apart. Occasionally they are dibbled, about three or four peas being dropped into each hole, and the holes placed a foot or more apart, when, of course, less seed is required. In field-culture no supports are used, the expense of sticking being thereby avoided. The crop is thoroughly hoed as long as hoeing is practicable. In June and July the picking for preserving takes place. Only young peas are preserved, as they turn out best, and are more like fresh ones when they are afterwards cooked. The later pods rarely contain so many peas as the earlier.

From what has been said it will be understood that the average yield is rather difficult to ascertain; but 150 bushels of pods per acre may be considered a fair crop. This year, indeed, I saw a crop of Yorkshire Hero peas from which 300 bushels per acre were gathered, whilst there would most likely be from $1\frac{1}{2}$ to 2 qrs. of seed left in the haulm. The price of pods would, probably, be about 2s. per bushel, and this quantity might shell out $\frac{1}{2}$ a peck or more of peas, according to the variety, season, and time of year.

W. J. MALDEN.

FOOT-ROT IN SHEEP.

At several recent meetings of the Council of the Society reference has been made to the familiar and troublesome complaint termed Foot-rot in Sheep. So far as is known, the disease has never yet been associated with the presence of any specific micro-

organism, though, in these days of bacteriological research, it might have been thought that so widespread a disorder would have attracted the attention of investigators, had there been reasonable hope of successful exploration in this direction. As a matter of fact, opinions upon the subject vary considerably, and it is with the object of presenting different sides of the question, rather than of recording any new advance, that the following notes are presented. Emanating from different sources, they set forth the views both of flockmasters and of professional men. They cannot perhaps claim to constitute a symposium, but it is hoped that they may serve to stimulate inquiry—at least on the part of those who still regard the question as an open one.

It is deserving of mention that the United States Department of Agriculture, in an official document,¹ dated October 13, 1890, defines the term "contagious diseases" as including *inter alia* "sheep-pox, foot-rot, and scab in sheep." Hence foot-rot is, on the authority of American veterinarians, scheduled as contagious.

The subjoined notes are contributed by the following flockmasters in the order named:—

1. Mr. James Nott, Penn Hall, Eardiston, Tenbury, Worcestershire.

2. Mr. W. J. Malden, Cardington, Bedford.

3. Mr. David Buttar, Corston, Coupar Angus, N.B.

4. Mr. Charles Howard, Biddenham, Bedford.

These are followed by observations:—

5. From the writings of Professor G. T. Brown, C.B.

6. From a new work by Professor J. H. Steel, F.R.C.V.S.

1. Mr. James Nott.

As this disease seldom kills the animals outright it is often neglected until it becomes almost unbearable, when it is usually treated until it is *nearly cured* and then allowed to run on again, becoming eventually as bad as ever. This is, I think, because nearly everyone is under the impression that it cannot be entirely and permanently got rid of. I need not say that a knowledge of the manner in which it is introduced into the system or the foot, of the time required, and of the circumstances or conditions under which this takes place, would be a material help in suppressing, and keeping free from, the complaint.

¹ *Regulations for the Inspection and Quarantine of Neat Cattle, Sheep and other Ruminants, and Swine, imported into the United States.*

In the case of people who are always buying sheep, it is, under existing circumstances, quite impossible to avoid foot-rot, owing to the prevalence of the disease. In the case of those who only breed and do not deal in sheep, there is, if ordinary care be exercised in the introduction of the few animals it may be necessary to buy, no difficulty whatever in keeping free from foot-rot—this, at least, is my experience.

For more than twenty years I have kept a small breeding flock, ranging from sixty to 300 animals, and have never known a case of foot-rot to arise spontaneously, or from the most unfavourable conditions for the feet under which I have known sheep to exist. Yet all the flocks in this neighbourhood, under similar circumstances, continually have foot-rot more or less, according to the season, whether they are dry or breeding flocks, and this because it has never been thoroughly eradicated. To get rid of the complaint it is necessary, before all things, that every hoof upon the place should be examined, and all animals that are diseased, however slightly, placed by themselves. At the same time, a strict watch must be kept upon the sound sheep for at least three months, placing them if possible upon a completely fresh lair, and never letting them go where the diseased animals have been. If they continue quite well, and if they form the bulk of the flock, I would rather sell the rest, even if cured, than run the risk incurred in introducing them again amongst the sound animals. Sheep that have suffered from foot-rot are never safe, until after the expiration of a considerable time, but how long I cannot exactly say. This is, I think, the great reason most farmers consider foot-rot arises spontaneously, as if the diseased animals are separated for treatment at all they are returned to the sound sheep as soon as apparently well, with the result that, after a little time, especially if the season favour foot-rot, the attack comes on again as severe as ever.

Nearly every practical man knows how to *cure* foot-rot, and this is scarcely worth speaking about in comparison with the means of keeping free from it. I recommend that every bit of diseased surface should be exposed with the knife down to the quick, but not beyond it, as the blood interferes with the dressing; the latter should be of a more or less caustic nature, and the feet should be kept dry for some time after applying it. Let this be repeated as often as appears necessary, no matter how busy one may be with other things. In unfavourable weather it is a good plan to dress the feet in the evening, keeping them in the dry till morning.

My own experience may be briefly recorded. From the time of my first keeping sheep, especially during the period from 1867

to 1878, I generally imported foot-rot every time I purchased fresh animals; but, taking a greater interest in sheep than other farm stock, and being rather partial to the work of dressing their feet, I generally quickly got rid of it, especially as I did not buy very often. At this time I took another farm, and in consequence had to increase my sheep stock to a considerable extent; in the course of doing so, foot-rot developed so badly that I began to despair of getting rid of it. At length I became so tired of the work of dressing the feet that I determined, if I ever did get rid of foot-rot, I would not buy sheep again in any number. This resolution I have adhered to ever since, with the result of never having a case of foot-rot except amongst the few animals the strange sheep might be placed with.

In 1879 the liver-rot came and swept both sheep and foot-rot away, except about thirty yearlings and two or three other sheep, which, being on another farm, escaped liver-rot and foot-rot alike. With these I bred again. On September 19, 1880, I bought a ram of the late Mr. Randell, of Chadbury, but he brought no complaint. In 1882 I bought from a neighbour a ram apparently free from foot-rot at the time, though I had seen him suffering from it previously, so that I only placed him with two or three other sheep, which remained all right. Thinking I was safe, I placed him with the ewes, but he had not been with them more than a week when one was observed to be lame and suffering from foot-rot. Consequently she and the ram were removed at once, and luckily no more succumbed. Still it almost threw the ewes out of season, as I could not readily get another ram. Eventually, at the end of October, Mr. J. Bowen-Jones, Ensdon House, Shrewsbury, supplied me with a ram lamb which proved sound. In December 1883 I again bought from a neighbour a ram which brought no disease.

In the autumn of 1884 I purchased a ram lamb affected with a trace of foot-rot; he was cured and placed with the ewes with no ill results. In December 1885 two ram lambs were purchased without foot-rot following. In the winter of 1886 an aged ram which was bought from a neighbour was apparently free from foot-rot, but upon being placed with some wethers they soon became affected with the disease, and were sold right away. A ram lamb bought in the autumn of 1888 brought no disease.

Early in 1889 I bought from a neighbour an aged ram with the foot-rot. He was placed by himself, and constantly dressed until every trace of foot-rot had disappeared, when he was placed with another young ram in a 12-acre meadow where no sheep had been for months. They kept right until washing time (several weeks), when a third, an aged ram, which had never had

the foot-rot in his life, was placed with them, and the very next morning the young ram was lame, and was found to be suffering from foot-rot. In about two weeks the aged sheep had it also, and on the stranger it showed itself in the course of another week or so. We dressed them, curing first one and then another, but never getting them all three well at once. When the purchased sheep seemed all right he was removed, and put with two or three weaning calves until it was time to put him to the ewes; neither ram nor ewes subsequently showed any symptoms of foot-rot. The other two rams were sold. These details must be very uninteresting, but they include every sheep I have purchased since 1878, except a ram lamb from Mr. Gilroy Temple, Laughterne, near Worcester, in the autumn of 1889, which brought no disease.

Though fully prepared to get foot-rot after buying sheep, especially if some of them were affected with the complaint at the time, I hardly expected to get it through the purchase in 1882 of a single animal, more particularly as that animal was not suffering from it himself. If I had not known that he was labouring under it some time before, my faith might have been shaken as to the possibility of keeping perfectly free from it, as up to 1878 I had never been free for a very long time together, through buying a few sheep now and again. As I had to wait until the autumn of 1886 before another case arose, what could I think except that it was the introduction of the fresh sheep, though not affected himself, and only coming out of a flock affected with the disease, which had given it mine? Moreover, only those sheep were affected to which he was introduced, and no other case of foot-rot showed itself until the spring of 1889, after the introduction of another sheep. At the present time I have not on my place a single animal of my own breeding—and they are all so except two—which has ever had foot-rot. The same is true of their mothers before them, after living, breeding, and sometimes dying a natural death, without my having occasion even to look at their feet. I think this is strong evidence, whatever people may believe, that foot-rot will not arise spontaneously on this particular farm, or indeed upon any of the three I have occupied in this neighbourhood.

There are farmers besides myself who find they can keep free from this disease by not dealing in sheep, only breeding. They think it necessary, however, to be careful about moving troughs frequently and in not having the animals too thick upon the ground or under trees, where they lie closely and very frequently for shelter in the summer, or in certain low-lying grassy orchards or lattermath, &c. If the least trace of disease

is present, it may no doubt be rapidly developed under these circumstances, especially in a showery time. Some people say they can produce the disease in a fortnight amongst sound animals by placing them in unfavourable circumstances for the feet. I have had young sheep for nine months at a stretch, penned up under very much more than ordinarily unfavourable circumstances for the feet, without the least trace of foot-rot arising. It was only necessary to remove excess of horn at the middle and at the end of the time, the animals continuing as sound and upright as possible. One of my neighbours saw these sheep from time to time, expecting them to break out every day, although he knew I had never had a case under the ordinary routine of the farm. When he found that no ill effects followed, he began to believe there must be something in what I had told him, and commenced operations upon his own sheep, which were very lame with foot-rot at the time. The result was the complete eradication of foot-rot from his young sheep in a short time, and from the older ones in a reasonable time afterwards. He is now probably completely free from this distressing complaint, not having had a case for months past, although he had not been without it for years previously.

This is the only case I have ever known in which the foot-rot has been rationally treated with a view to stamping it out, and it appears to have succeeded. As a rule, the difficulty is to get people to be particular enough, and persistent enough, in following out the treatment to the end, instead of leaving off when the disorder is apparently no longer doing any damage, or neglecting it when a busy time comes on. It is a work which requires the master's eye constantly, or, better still, his hands as well. What, however, is even more important is not to re-introduce the disease unawares after once getting rid of it; yet this is what I believe is constantly being done, though quite unwittingly, and is the reason most people think the disorder comes spontaneously—and it certainly looks like it, developing with rapidity as it does under favourable circumstances. I am not at all surprised that practical men (who are not often scientific) should have been misled by such an insidious disease, and that the opinions concerning it are almost as many as the people who hold them. Scientific inquirers seldom have much practical acquaintance with it, the poor sheep scarcely coming under their notice, at least as regards their feet. Hence, for generations, our knowledge of the disorder has made but little progress. Flockmasters freely admit that nothing to which sheep are liable is more annoying, or gives more trouble, or is a source of greater loss to them than foot-rot. If what I maintain be

correct, that foot-rot cannot be developed unless by contact with affected sheep or their lair, and if full advantage were taken of this circumstance, the benefit to individuals and to the country generally would be immense.

A good deal of money is expended annually in trying to stamp out certain diseases to which farm stock are liable, but which are only local, and affect comparatively few individuals. Foot-rot is universal, and concerns almost every man who owns a score of sheep.

If it should be found that there are circumstances under which foot-rot can be produced, or will come of itself, independent of contact with affected sheep or their lair (a proposition I do not admit for a moment), surely these circumstances might generally be avoided. But even if not, and we are obliged to have foot-rot raging in certain districts, it need not be all over the country as at present. Or, why should my sheep remain free for years together, while the sheep of everyone else in the district, without exception, whether they buy or only breed, are continually suffering, notwithstanding that the sheep are of the same breed, are similarly managed, and are subject to the same conditions of soil and climate? Why should I generally get foot-rot, immediately after purchasing one of these sheep from the outside, amongst that portion of the flock to which he is introduced?

Why, moreover, does it not extend any further amongst my animals, if the single strange sheep did not bring it?

Until I can get satisfactory answers to these questions I must adhere to my opinion, although it is in direct opposition to that of thousands of farmers, including most of my friends and neighbours. I hope they may be all wrong, for their own sakes, for the country's sake, and for the sake of the sheep, and that I am right. If my belief be correct that foot-rot is contagious, and arises in no other way, it is a pity that the truth should be any longer hidden away.

In conclusion, I would say that foot-rot must not be held responsible for all lamenesses to which sheep are liable. If I might be allowed to speculate, I would say that I consider the true disease is quite independent of all circumstances of soil, climate, food, and water, or of structural differences in the animals, and that it requires the presence of a living organism, without which the disease is impossible.

2. *Mr. W. J. Malden.*

I have had experience with sheep in two districts which differ greatly as regards the effect of the land on foot-rot, although

they are both light land localities—the chalk soils of Wilts and Hants, and the gravels of Beds,—and it appears to me that the causes of foot-rot are very similar in both areas. The predisposing cause must be sought in anything which induces the skin between the claws to rupture. This seems further demonstrated when the feet of white-faced sheep are examined, and a comparison is instituted between the formation of the feet in different breeds.

Down breeds are more liable to foot-rot than are the white-faced. When the foot of a Down sheep is examined, it may be noticed that the claws are very close together, and that the skin is thin and tender. That this should be so is not surprising, because for centuries these sheep have run on their native downs, which are very hard, and are covered with short and generally dry herbage. On such lair the feet rarely sink into the ground, so that there is no need for the claws to spread out to prevent sinking. The feet of the white-faced sheep are bigger, the claws open more widely and more readily, and the skin between the claws has become hardened. This is but natural when it is remembered that these sheep have for long periods dwelt on soft grass land, and on arable land which is liable to puddle, and which during the greater part of the year will not carry the sheep clean on the surface. To adapt themselves to such circumstances the feet have expanded—the claws have spread out—so that they may be better able to resist the tendency to sink. The herbage on these lands is longer and often wetter, so that a breed of sheep possessed of feet which readily ruptured between the claws would not thrive. Doubtless, by natural selection, sheep which could not endure frequent wetting without chafing would not become permanent, but would give way to those better able to do so. The effect of lair on the feet is similarly noticeable in the case of horses, for those bred on the soft fens have feet broader and more open than those bred on hard soils.

White-faced sheep are but rarely moved on to soils which are less suited to their feet than those on which they are bred. Down sheep, on the other hand, are largely imported into other districts, where they seldom meet with such good lair. They more frequently have to live under the same circumstances as the white-faced breeds are accustomed to, and as they are not fitted for such conditions they fall lame where the white-faced remain sound. It is, indeed, not even necessary to transport Down sheep into other districts for them to suffer as much as they would if taken into a district of the white-faces. If they are merely driven from the Downs to the water-meadows, which are

often found within the distance of half a mile, the sheep may suffer as much from foot-rot as if they had been transferred to the Lincolnshire fens. Even when they are put on the gravel loams of the adjacent valleys, they suffer as severely as though they had been sent to the gravels of Beds. When they are turned on the broken-up Down land they do not experience much trouble, as the land generally carries them well; but if they are folded on vetches in wet weather they fall lame because the feet are constantly wet, and the vetch-haulm readily chafes the skin between the claws.

There are numerous means by which chafing may be induced. Such are, lying on wet straw in the lambing-yard; friction between the claws when they are wet, dirty, or contain dried vegetable matter and dirt forming a cake; sinking in the ground; malformation of the foot; neglect to pare the hoof; and many other causes known to the sheep-farmer.

If chafing continue for some time, it is likely to be followed by foot-rot; and that form of foot-rot which commences between the claws is the most common. I am inclined to the belief that this variety of foot-rot rarely, if ever, attacks sheep unless the skin between the claws is broken, or some portion of the sensitive region of the foot is laid bare. As the disease only breaks out when certain parts are exposed, it would undoubtedly appear that foot-rot is contagious, as the conditions point to inoculation, which could hardly happen if the skin remained whole. On two separate occasions, while I was working on my father's farm, foot-and-mouth disease broke out, and when this was cured the sheep—some 800 or 900 each time—fell with foot-rot. It was most difficult to heal because the hoofs came off, and the feet could not be kept free from chafing, whilst the foot-rot continually broke out afresh until new horn grew.

With these exceptions, I have never had any special difficulty in getting rid of the disorder. Doubtless the best means of preventing the disease is to keep the feet hard by having the sheep on firm lair; by hardening the skin with solutions which, inimical to the progress of the disorder, at the same time prevent any chafing; by making the sheep walk over caustic lime; by keeping the feet neatly pared. When the disease shows itself in a flock, the sheep which have fallen lame should be taken out and dressed, and not returned to the flock until quite sound. On hard chalk soils, containing flints, the feet generally keep naturally trimmed so that there is little to do but to dress them with a mild caustic, which may be applied in the form of powder, liquid, or salve; or the sheep may be made to walk through a trough containing a caustic solution. When

the animals are on soft land the feet should be constantly trimmed, so that they are always neat and with no overhanging portions of hoof to prevent a healthy circulation of blood; also to avoid chafing on any portion of the foot.

When the disease actually shows itself, more care is necessary to get the foot free from rough portions of hoof, and to pare the claws so that all diseased parts may be accessible to the caustic. It is, indeed, most essential that every trace of the disease should be reached by the application, otherwise the hoof will grow round the untouched spot, which will continue to increase in size, and, finding the lower portion of the foot too hard, will gradually extend upwards and burst out at the top of the hoof, in which position it will be a long and laborious work to cure it. If sheep are carefully dressed twice, a cure may be relied upon; but it is tedious, unpleasant, and expensive labour. Unfortunately, too, it is often not thoroughly done, and, as a result, the disease lingers about for some time. It is a mistake to use a very strong caustic, as the hoof is thereby made too hard, and grows in a bad shape.

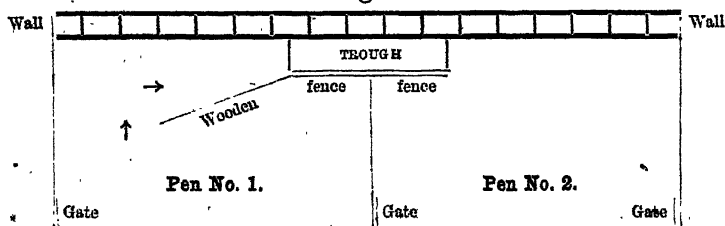
The kind of foot-rot I have been speaking about is the most common, but there is another form which is not looked upon as contagious. Whether this is in reality a separate disease it is difficult, in the face of much conflicting evidence, to decide. It certainly takes a somewhat different form, though it can be cured by the same treatment as the common kind. More skill is required, however, in paring the hoof, for the disease almost invariably works up the inside of the hoof and breaks out at the coronet, and is then spoken of by shepherds as the worst kind. As it is most common on soils which are most favourable to the usual disorder, it would appear that the lair must have a direct influence on its development.

3. *Mr. David Buttar.*

In the course of a letter addressed to Mr. J. Bowen-Jones, Mr. Buttar communicates the following instructions for dealing with foot-rot:—Pass the whole flock twice during the year through a solution of arsenic, which is thus prepared:—Boil 2 lb. of arsenic with 2 lb. of potash (pearl ash) in 1 gallon of water over a *slow* fire for half an hour. Keep stirring, and at any signs of boiling over pour in a little cold water; then add 5 gallons of cold water. Put this solution to the depth of 1 in. to 1½ in. (just sufficient to cover the hoofs of the sheep) in a strong, well-made, water-tight trough, 12 ft. long by 18 in. wide, and about 6 in. deep, with narrow strips of wood nailed

across the bottom to prevent the sheep from slipping. The trough must be set and fixed perfectly level alongside a wall or other fence in some out-of-the way place. It should be provided with a good waterproof lid, secured by a padlock, so as to prevent the possibility of danger from any poison which might be left in the trough. There should also be a wooden fence on the other side of the trough, extended somewhat at the entrance

Fig. 1.



end to guide the sheep into it, as indicated in the diagram (fig. 1).

Before the sheep are driven through the trough their feet should be well pared; then walk them quietly through and let them remain in Pen No. 2 for half an hour or so before taking them back to their pasture.

If sheep are badly attacked I would recommend drawing out all the affected ones, and passing them through the trough a second time, after remaining for half an hour in the pen. Should this not cure them, repeat the process in a fortnight or three weeks' time.

Having got free from foot-rot, the passing of the flock through this solution twice a year will completely prevent any new attack.

Before adopting this plan my sheep were scarcely ever free from the disease. Now I have not a single case, and have had none since I first resorted to the practice in 1885.

4. *Mr. Charles Howard.*

Commenting on the foregoing, Mr. Howard writes:—Although there is nothing new in the notes of the three farmers, yet I hope the attention of flockmasters generally will be called to the subject, and something good may come out of it. When I was a youth and first went to learn farming (some fifty years since), this disease was not known, or at all events not in the locality in which I was situated. It has now become the bane of a shepherd's life, and entails unknown losses to British flock-

masters. I am glad to say I have now but very few lame sheep. I owe this to the constant attention of my shepherd, and to the ointment I have been fortunate enough to meet with.

In the summer of 1889 I visited the farm of my friend Mr. Henry Page, of Walmer Court, Kent. I found he had but little, if any, foot-rot among his sheep, and in the course of discussion he told me he could cure it in one or two dressings at most with an ointment which his old foreman prepared. He sent me some to try, and both I and my shepherd were so struck with it after using it that I wrote to Mr. Page requesting him to induce the old man to part with the recipe by paying him the small sum he required. This is the ointment I refer to, of which the following is the recipe:—

2 oz. verdigris, powdered.	1 oz. caustic, powdered.
2 oz. armenic (Armenian Bole), powdered.	$\frac{1}{2}$ pint turpentine.
2 oz. blue stone (blue vitriol), powdered.	4 oz. Stockholm tar.
	2 oz. hog's lard.
	2 oz. oil of vitriol.

Pour the oil of vitriol on last, and very slowly, or it will boil over. Keep stirring with a stick until it leaves off boiling.

Mr. Page's farm is on the chalk, and therefore less subject to foot-rot than many other soils, my own amongst the number. I have, during a rather long experience, tried all sorts of remedies for this troublesome and wasting disease, but I have never found any so effective and speedy in its cure as this. I shall be very glad indeed if, by the publication of this recipe in the Journal, it should prove the means of doing the same good to many other breeders as it has done in my flock.

The course I pursue is to draw out all the lame sheep, take them to some dry hovel or shed, thoroughly well pare their feet so that the disease is bottomed, and then apply the ointment. The sheep remain in the shed, or in a dry gravelled yard, for at least one night. I am quite sure that, by the use of this ointment, and with proper attention, the disease can be kept under.

I fear that, in many cases, the shepherd is not sufficiently relieved of his ordinary duties to attend adequately to the sheep's feet. When the disease is prevalent he should have all the assistance he requires. It is most desirable that the sheep's feet should be every few weeks properly pared, a practice that will tend very much to retard the disease.

Foot-rot is one of the most subtle of diseases. I have known my sheep to be quite free from it upon one farm, but if taken to another, upon which there was pasture with abundance of trees, they would within a very few days begin to fall with it.

Mr. Nutt's theory is not always correct. I know many farms

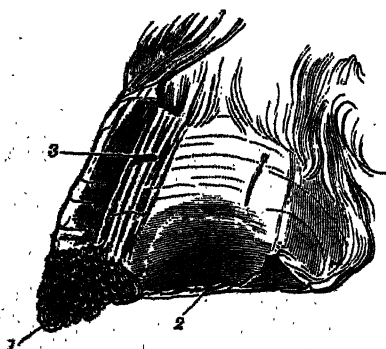
where no sheep are ever bought, yet foot-rot is always existing upon them. It would be useless for our West of England men to breed their lambs unless the holders of root-growing farms of other parts of England bought them for consuming their green crops.

5. Professor Brown, C.B.

As long ago as 1864 Professor Brown communicated to the *Journal of the Bath and West of England Society* a paper entitled "Foot-rot in Sheep; with Observations upon the Allied Diseases in other Animals." The author wrote: "By some it is considered to be malignant, developing during its progress a peculiar poison or virus, which is capable of producing the same disease, by inoculation, in a healthy foot. Other observers deny the contagious property, and refer the spread of the disease to the general prevalence of the cause in the locality where it may exist." He remarked that, concerning the essential characters which distinguish foot-rot from other affections of the foot of the sheep, very little appears to have been ascertained. "Should farmers consider this admission a reflection upon veterinary science, they are requested to pardon the suggestion that veterinary science has had very little to do with the matter. The great authority always has been the shepherd, whose assertion of

the presence of 'foot-rot' or other disease in the flock is not likely to be questioned."

In different parts of the same foot, and among different animals, it is possible to distinguish many stages of the disease, as it affects the horn of the hoof. In a white hoof a dark spot may be detected, indicating a hollow place. A very close examination may probably result in the discovery of a minute fissure, $\frac{1}{8}$ inch to 1 inch long,



1. Shrivelled or decayed horn. 2. Dark spot, indicating a cavity. 3. Minute fissure.—(Brown.)

crossing the hoof transversely. The illustration (fig. 2) represents these three conditions in one hoof, instead of in three feet of the same animal, as they really occurred.

1. Represents the broken, or, more correctly, the withered portion of the horn.

2. Indicates the presence of a hollow cavity containing dirt.

3. The minute fissure, apparently superficial, existing as a dark line upon the wall of the foot.

The precise structural alterations which result from foot-rot appear to be the following:—

a. Mechanical derangement of the structure of the hoof and the introduction of gritty particles into the canals or into accidental fissures.

b. Softening and disintegration of the horny structure by the moisture of the soil and the exuded fluids from the internal membrane.

c. Irritation of the internal membrane, causing excessive secretion of epithelial cells with serous exudation, associated with increased vascularity and sensibility.

Subsequently, in 1868, Professor Brown communicated to the same Journal another paper, "Observations on the Diseases of the Foot of the Sheep generally comprehended in the term Foot-rot; with a Report of Experiments which were carried out for the purpose of deciding the disputed question of the contagious or infectious nature of these diseases." On this occasion it was remarked:—

"Many authorities adopt the conclusion that foot-rot depends upon local conditions, and is altogether unconnected with infection. Others assert the disease to be so contagious that a single animal affected with foot-rot, if introduced among a healthy flock, is capable of communicating the disease, and that not only to the sheep with which he comes in contact, but in a manner also to the land, so that the previously healthy soil acquires a new character, and becomes foot-rotting land."

The difficulty attending the inquiry was illustrated in the following extract from the first paper:—

"Most of the information conveyed to us comes from men who were not acquainted with the characteristic elements of the disease, and who seem to have recorded effects irrespective of their possible causes, giving, in place of logical deductions, the mere impressions which the facts made on their own minds at the time of their occurrence. The only direct evidence bearing upon the question refers to inoculation, and the conveyance of the disease by an infected animal to a perfectly healthy locality. On both these points the results recorded by different observers are opposed. The facts advanced on one side prove that the disease will spread from a diseased sheep to healthy animals in a previously healthy situation; and, further, that direct contact of a healthy foot with the matter from a diseased one will induce the disease. The facts on the other side prove that a diseased sheep may with impunity be allowed to mingle with healthy ones on a dry soil, and that contact with the matter of 'foot-rot' is not injurious unless the healthy foot has been previously denuded of a portion of its horny covering."

After recording various cases of conflicting evidence, the author proceeded:—

"Nothing can be more graphic than the descriptions which have been quoted, and, if read in the light of recent experience, they furnish a clue to

the explanation of numerous discrepant opinions upon the subject of foot-rot in sheep. The observations which have been made during the last few years have established in the writer's mind the conviction that the foot of the sheep is liable to at least five distinct diseases, which are produced by independent causes, and in their earlier stages quite easily recognised by their characteristic features. One of the five affections generally comprehended in the term foot-rot is undoubtedly *highly contagious*. Another of them . . . can be propagated by the action of the morbid products of the disease, when all the conditions are favourable. The remaining three varieties are consequent upon mechanical influences, and only occur when those influences are in action. These conclusions, the truth of which now scarcely admits of a question, furnish at once an explanation of the great differences, which have been noticed by observers, in the characters presented by the diseased parts, and also of the contradictory opinions which have prevailed, as to the contagious nature of the malady."

In discussing the diseases of the foot of the sheep, Professor Brown divides these into (1) those in which the hoof horn is primarily affected, and (2) those in which the hoof horn is secondarily affected.

Under the first head he classes the following non-contagious forms:—

a. That variety of which an illustration (fig. 2) has already been given. It exists on sandy soils or upon clay lands where much grit is mixed with the clay; it prevails most extensively in wet seasons, but even during a certain dry summer occasional instances were met with.

b. That variety dependent upon the overgrowth of the hoof-horn, which occurs particularly among sheep that have been removed from a bare upland pasture to a rich, soft, lowland turf. In this form the hoof is primarily at fault, and the derangement of internal structure is a result of the external changes. As in the variety previously noticed, however, when the malady is fully developed, every distinctive character is lost in the general morbid state of all the foot structures, and very frequently the implication of adjacent parts.

c. That variety arising from injuries inflicted from without. Punctures from thorns, wounds caused by projecting sharp stones, and occasionally the accidental introduction of a nail into the foot, may be followed by inflammation, and, if neglected, by the separation of the hoof from the secreting membrane, and the successive appearance of those changes of structure which are observed in foot-rot, as the term is understood.

With reference to those forms of foot-disease in which the hoof-horn is secondarily affected, it is observed that sheep are undoubtedly liable to at least one affection of the feet of a decidedly contagious character—that, namely, which is identical with foot-and-mouth disease in cattle. Another form of the foot-disease, which may be distinguished as "contagious foot-rot," prevails on certain lands, and especially during wet weather. To investigate the pathology of this disease an inquiry was undertaken in 1867 at the suggestion of the Maidstone Farmers' Club, three affected sheep being made the subjects of the experiment.

In the early stage of the disease these animals had the hoofs

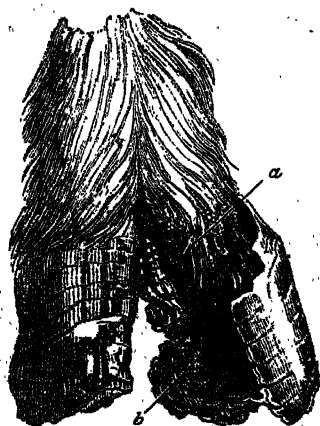
perfect; a careful search was made to discover, if possible, any minute fissure, or other defect in the horn, of the kind depicted in fig. 2, but without success. The disease was confined to the skin, between the digits of the fore-feet: the surface was red, tumid, and pulpy, and a small quantity of white purulent matter existed on the inflamed parts. These cases subsequently became much more decided in character, the hoof grew to an extraordinary length, fungoid growths appeared, and all the indications of the worst form of foot-rot were apparent in two months after the sheep were received. The illustrations, figs. 3 and 4,

Fig. 3.



Representation of a sheep's foot affected with foot-rot in the early stage, produced by rubbing the matter from a diseased foot on the integument between the digits at the part indicated by *a* in the figure.—(Brown.)

Fig. 4.



Representation of a sheep's foot affected with foot-rot in an advanced form. The hoof-horn of both digits has grown to twice the normal length, and, at the inner surface, is found to be broken and rotten, as shown at *b*. From one digit the hoof-horn is nearly detached, exposing the internal foot *a*, covered with fibres of soft horn (fungoid mass).—(Brown.)

indicate the extent of abnormal alteration of structure in the early and advanced stages of the malady.

Foot-rot, of the variety under discussion, may be aptly described as primarily a disease of the skin which induces the exfoliation of the cuticle and the abundant exudation of a fluid containing a large quantity of epithelial scales; and, secondarily, as the extension of inflammation to the membrane of the foot (the analogue of the true skin), causing the exfoliation of the hoof (the analogue of the cuticle) and the development of fluid containing a quantity of detached epithelial scales, which

unite to form an imperfect horny layer upon the diseased membrane.

In order to test the contagious nature of the disease, the affected sheep were placed in a pen, the bottom of which was covered with a sufficient quantity of straw. As the pen was not cleaned out, and as no fresh supply of litter was given, the sheep were compelled to stand upon a soft mass of manure, which was purposely kept moist that no conditions might be wanting for the production of the disease. Three sound sheep, obtained from a locality where foot-rot is unknown, and whose feet were perfectly sound, were placed in the pen with the diseased animals on January 16. For ten days the sheep were left undisturbed, and at the end of that time the feet of the sound sheep were again inspected and found to be still quite free from disease; the skin between the digits was also perfectly healthy. To test the comparative effects of inoculation and exposure, two of the sound sheep were inoculated, and also one of the diseased animals in a healthy foot; the other sound sheep was left untouched.

Without reciting the details of these experiments, it may suffice to say that the results were not sufficiently definite to warrant the assertion of a positive opinion either in favour of, or opposed to, the contagious nature of foot-rot. They, however, established the fact that the introduction of the matter of the disease under the skin in the vicinity of the foot was followed by the development of symptoms of the incipient stage of the affection. But the morbid changes did not in either case advance to any great extent, and perfect restoration occurred in two months after inoculation, notwithstanding that no treatment was attempted, and the sheep during the whole course of the experiment were confined in a pen, the floor of which was covered with moist litter, and at the same time they were in contact with three animals affected with foot-rot.

Further experiments were made with the same sheep, and the results were so far definite as to establish the fact of the contagious nature of one form of foot-rot properly so called; but at the same time to prove that the contagious property is only developed after a long period of exposure, and then under certain conditions. On a perfectly dry surface the disease, so far from extending to sound animals, will quickly subside; but if the necessary amount of moisture is present in the land, foot-rot, it was shown, may be communicated by simple contact in from six weeks to three months after the introduction of the diseased animals.

Professor Brown concluded that these experiments teach the

necessity of caution in reference to the introduction of fresh stock upon a farm :—

“For notwithstanding that of five varieties of disease of the foot structure only two of them are propagated by contagion, it is difficult to distinguish one disease from another when each is fully developed, and hence when the land is naturally moist, or during a wet season, only sheep with sound feet should be placed among the flock. Finally, in reference to treatment, it is sufficient to remark that the most certain and simple method of cure is to place the affected animals upon a perfectly dry ground where loose stones, gravel, and broken mortar are scattered about; but if their retention on the wet land is unavoidable, the removal of the loose horn and the application of tar and caustic dressing will effect all that is possible under such adverse circumstances.”

6. *Professor J. H. Steel, F.R.C.V.S.*

Additional information is derivable from a valuable and comprehensive manual¹ which epitomises the latest acquired knowledge on subjects relating to ovine pathology. Professor Steel states :—

“The *contagious foot-rot* is a disease which for a long time has been confounded with ordinary foot-rot, and the existence of which is even now denied, especially in Great Britain. Accumulated evidence as to its occurrence has been effectual in securing its recognition by the profession, and practical action against its spread will in the future no doubt be more frequent than hitherto.”

Again :—

“Professor Law (*Veterinary Journal*, September 1876) shows that contagious foot-rot is communicated by sheep which have suffered from the disease for months, which is contrary to foot-and-mouth disease; also it is not conveyed to other ruminants and pigs, but sheep only suffer. The evidence as to there being a contagious foot-rot, collected and recorded by Law, is most valuable and deserving of careful study. He discusses the nature of the contagium. He argues that the disease, not being eczema epizootica, nor foot-mange, nor (as Morel has suggested) due to some animalcule acquired from the pasture, it may be a fungus, an organic germ, or cell-elements of the diseased surface which have taken on themselves unnatural potential energies. What it is remains an open question.”

As regards transmission of foot-rot, Professor Steel quotes W. C. Spooner, as follows :—

“When the horn is dry and strong, and free from cracks and fissures, and the skin above also sound and properly lubricated with the unctuous secretion which is here particularly supplied, there is no disposition to absorb foreign matters, but, on the contrary, a power of resisting their influence, and thus we cannot be surprised that the foot-rot matter has no

¹ *A Treatise on the Diseases of the Sheep.* By John Henry Steel, F.R.C.V.S., Professor of Veterinary Science, and Principal of Bombay Veterinary College. London: Longmans, Green & Co. 1890.

effect under such circumstances. When, however, the oily secretion is washed off, the skin is in an irritable and probably sore state from the friction of the wet and dirt between the clees, the horn long at the toe and ragged underneath, and particularly the upper or coronary portion which unites with the skin, and consequently is very thin. When this part is blanched, weakened, and probably in some degree separated from the skin above, we cannot be surprised that such a state of the parts must greatly expose them to the action of any infectious matter from without.

The author revives the argument of the late Professor Dick, that, as the state of the pasture affects simultaneously all the flock upon it, so it is no wonder that many suffer from the same result of a uniform cause; hence the apparent contagiousness of foot-rot. Further, the seeming invasion of foot-rot among fresh sheep brought into contact with lame ones is mostly a result of the former being subjected to the conditions which have already given rise to it in the latter, and generally it will be found that supposed contagion is due to this. Again, the frequently recorded instances of a diseased ram bringing the disease among ewes is associated with the fact that pregnant ewes are notoriously liable to foot-rot as being much better cared for, better fed, and less travelled than flocks intended solely for wool or mutton, and such cases may often be associated with specially wet seasons, which remain unnoticed as possible causes of increased spread, coincidently with putting the ram with the ewes.

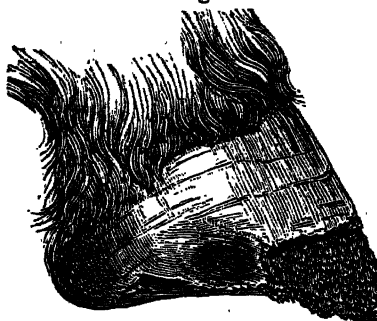
"The question at issue should not," says Professor Stéel, "be worded, 'Is foot-rot contagious?' but, 'Is there a contagious form of foot-rot?'" He asserts that there is, but that it is not

Fig. 5.



Condition of internal wall of digit
in an early stage of foot-rot.

Fig. 6.



Confirmed stage of the first form of
foot-rot.

nearly so frequent in Great Britain as the simple foot-rot, and that the latter must not be mistaken for the former when it arises

uniformly among sheep in a flock subjected to like disease-producing influences.

Professor Steel further remarks that Dick showed how overgrowth of horn through insufficient wear altered the bearings of the foot, throwing extra strain on the crust and producing laminitis; how the diseased state of the laminæ rendered the horn soft and penetrable by grit; how the horn curling over, inclosed grit and filth, which gradually worked their way up to the sensitive parts; and how excessive growth of hoof gave rise to strains and other injuries of the pastern and fetlock joints. He also noticed that inflammation of the skin of the interdigital space might arise from the friction of long, coarse grasses, and be known under the popular name of *Scald*. He found this the most frequent form in low, rich pastures, where the grass was long, but on dry soils the form commencing from the sole was generally observed.

The characteristic illustrations shown in figs. 5 and 6 are, by permission of Principal Williams, of Edinburgh, reproduced from his work on Veterinary Surgery.

THE COMPOSITION OF SOME OF THE FAMOUS ANCIENT PASTURES OF ENGLAND.

MUCH has been written in recent years on ancient pastures, but much has yet to be learned before we know fairly well their story, and the light they throw on the problem of making a good pasture. With the view of accumulating further knowledge, I was requested by the Seeds and Plants Committee of the Royal Agricultural Society to inspect such pastures in England as had a good record for feeding or fattening stock. To ascertain the localities desirable to visit in this investigation, I addressed letters to all the members of the Council, and obtained information which induced me to visit twenty-three districts and to inspect some 150 pastures. These represented very different types on varying soils, well distributed over the whole of England. In two of the districts I found only fields that had been laid down within a known and comparatively recent time. Much interesting information was obtained, though not bearing on the investigation in which I was engaged. Partly for the same reason, and partly because the pastures in many of the districts agreed

so closely in the nature of their herbage that it was not necessary to deal with them separately, the number of pastures included in this report is reduced to 63.

The following are the pastures dealt with in this paper:—

The feeding meadows [1 and 2] on the extensive shore plain at Preston Place near Worthing (Sussex), belonging to Mr. R. A. Warren; those [3 to 6] below high-water mark on the alluvium of the river Arun, some five miles to the north of Preston Place: and one field [7] in the same locality at a higher level.

The pastures [8] at Bulbridge, Wilton (Wilts), in the occupation of Mr. James Rawlence.

The park and pastures [9] at Cricket St. Thomas, near Chard (Dorset), the seat of Viscount Bridport.

The park and pastures [10] at Killerton, north from Exeter (Devon), the seat of Sir Thomas Dyke Acland, Bart.; and pastures [11] on the alluvium of the Exe, in the same neighbourhood.

The hill pastures [12 to 15] at High Bray, seven miles north of South Molton (Devon), also belonging to Sir Thomas Acland. These pastures are about 800 feet above the level of the sea.

The famous pasture [16] of Pawlett Hams (Somerset), on the rich alluvial soil of the Parret near Bridgewater.

The pastures [17 and 18] at Batsford, near Moreton-in-the-Marsh (Gloucester), the property of Mr. A. B. Freeman-Mitford, C.B.

The meadows [19 and 20] at Hampton Court, near Leominster (Hereford), the seat of Mr. J. H. Arkwright.

The meadows [21] at Newnham Court, near Tenbury (Worcester), the property of Mr. E. Vincent V. Wheeler.

Pastures [22] on the alluvial plain of the Severn, a few miles to the west of Shrewsbury (Salop).

The park and pastures [23 to 25] of Stapleford Park, near Melton Mowbray (Leicester), the seat of Mr. James Hornsby.

Pastures [26 and 27] near Syston Park, Grantham (Lincoln), the seat of Sir John Thorold, Bart.

The pastures [28] at Inningham, and [29] on the alluvial plain of the Humber (Lincoln).

The park and pastures [30 to 40] at Duncombe Park, near Helmsley (Yorkshire), the seat of the Earl of Feversham.

A pasture [41] at Newton Morell, near Darlington (Durham), and pastures [42 to 45] near Ravensworth Castle (Yorkshire).

The Beaufort grass lands [46], and the Halton parks [47 and 48] near Hexham (Northumberland).

Pastures [49 to 51] at Meldon, and [52] at Angerton, near Morpeth (Northumberland).

The pastures [53] at Whittingham, near Alnwick (Northumberland), belonging to the Earl of Ravensworth.

Pastures [54 to 56] at Swinhoe, and [57] at Tughall Grange, near Chathill (Northumberland).

The meadows [58 to 60] at Rigmaden, near Kirkby Lonsdale (Westmoreland).

The pastures [61 to 63] at Althorp Park, near Northampton, the seat of Earl Spencer.

In all fairly stocked pastures one observes, in the autumn, portions that are closely eaten down, and others where the plants have been allowed to run to seed. Such plants may be collected in small patches which are due to the droppings of the stock, and though the vegetation is very vigorous from the influence of the manure, and should supply a tempting bite to the stock, it is left untouched because of the presence of the offensive droppings. These plots are very useful to the inquirer, as they supply a fair indication of the herbage of the field. They are not desirable, however, in the field, because of the loss of food and perhaps still more because of the opportunities they afford for the growth of ergot. This autumn I gathered fifteen ergoted grasses in such a plot, not more than two square yards in area. Most of the heads had several ergots, and on one cocksfoot I found nine. Had the ergots been equally numerous in the fruiting grasses throughout the field it would have been very dangerous to any gravid animal feeding there. Ergot begins its attack on the grass when the flower is getting fully developed. It then settles on the tender seed, and uses for its own growth the food which was destined by the grass for filling up the seed.

Ergot lives only on the seed, and it cannot appear until the grasses are in flower. It has been met with on most of our pasture grasses, and the ergot from any one of the grasses will in the following year produce seeds (spores) which will reproduce the ergot on any other grass. I cannot refrain from expressing my conviction that very few farmers recognise this dangerous parasite in their pastures, or at all realise the injury it may cause to their stock. The spreading of the droppings would secure the eating down of the pasture regularly and the little expense incurred would be more than repaid by the gain in the pasture.

The bents or fruiting stalks of grasses are more frequently due to the rejection of some elements in the pasture by the stock. The bare places have supplied baitable plants, which have been eaten down, and so the flowering stalks have not been produced. On the other hand certain grasses which are dis-

liked for food are almost always allowed to run to seed. The best illustration of this is the case of crested dogstail. The grasses amongst which it grows may be carefully eaten down, while every plant of dogstail has been allowed to send up its flowering stalk. In this way some pastures appear in autumn to be composed entirely of this grass, whereas, as far as the stock is concerned, the pasture would have been better had it not been there.

In the same way, Yorkshire fog is rejected by stock; but, as this grass produces a considerable amount of foliage, it always secures the rejection of some good grasses growing beside it. Even a few plants of this grass are consequently undesirable in a pasture, not only on their own account, but because they prevent the utilisation of the good grasses in their immediate neighbourhood.

Unlike the bents of the dogstail, which are scattered generally over the pastures, the bents of the Yorkshire fog with their great radical leaves occur in patches, and these occasionally of great extent. In some meadows the half of the area is next to useless to the summer stock because of the prevalence of this grass. This very evil has strangely come to be looked upon by many as something of a virtue. Again and again when I have pointed to the serious detriment to the pasture from the presence of so much *Holcus*, I have been assured of its great value, because the whole of it would be consumed by the lean stock which would be placed on the field in the late autumn. It is of course true that hungry animals are compelled to eat this grass when there is nothing else to be had; but it is forgotten, first, that the dry bents have lost their seeds, which have fallen on the ground to still further increase the number of these objectionable plants, and still more that the leaves and stalks have been nearly emptied of the available food they possessed by its having been transferred to the seeds, so that the valued pasture which the starving animals are driven to consume, so far as it consists of Yorkshire fog, supplies them with scarcely any nutriment. One cannot realise the great loss that yearly befalls the farmer from the presence, to so great an extent, of this grass, at first rejected by stock and then next to valueless when the stock are compelled to eat it. Where it is permitted to remain in a meadow, it would be much better to cut the patches when the grass comes into flower, and make it into hay. At the flowering period the tissues are full of food—protoplasm and starch—and the hay if eaten by stock would afford them some nourishment. But it must be remembered that it is no more palatable to stock in the form of hay than in its green state. A

further benefit would be got in cutting the flowering *Holcus*, as this would prevent the ripening of its seeds, and the natural multiplication of the plants. Unfortunately, all rejected grasses secure in this way a great advantage in the struggle for existence over valuable grasses, for these latter, being prevented from seeding, depend for their increase on any provision they may have in their roots or runners.

It is no doubt important in laying down pasture to learn from neighbouring meadows what are the most suitable grasses to sow; what flourish best and what are most consumed by the stock. Superficial observers are often misled by the plants which, having been rejected by the stock, have run to seed and so make the greatest show in the autumn. The practical man does not need to have it pointed out that the grasses and other plants in a pasture which run to seed are the plants to be rejected by him, as they have been rejected by the stock.

The month of August and the beginning of September were occupied in visiting the different localities. The different pastures are arranged in the following series of tables, which exhibit at once to the eye the various grasses of which they are composed. No notice is taken of individual plants; only when the grasses were in quantity sufficient to influence the quality of the pasture, have they been introduced into the tables. The grasses are separated in the tables by stronger lines into three sections:—

- (1) The best grasses met with:—Cocksfoot (*Dactylis glomerata*, L.), Meadow Fescue (*Festuca pratensis*, Huds.), Fox-tail (*Alopecurus pratensis*, L.), Timothy (*Phleum pratense*, L.), Rough-stalked Meadow-grass (*Poa trivialis*, L.) and Yellow Oat-grass (*Avena flavescens*, L.).
- (2) Grasses of second quality:—Rye-grass (*Lolium perenne*, L.), Fiorin (*Agrostis alba*, L.), Hard Fescue (*Festuca duriuscula*, L.), Dogtail (*Cynosurus cristatus*, L.), Tall Oat-grass (*Avena elatior*, L.) and Sweet Vernal (*Anthoxanthum odoratum*, L.).
- (3) Inferior grasses:—Squirrel-tail (*Hordeum pratense*, Huds.), Hassock-grass (*Aira cæspitosa*, L.), Brome-grass (*Bromus mollis*, L.), and Yorkshire Fog (*Holcus lanatus*, L.).
- (4) A fourth section is devoted to Clovers, Yarrow, and Rib-grass.

The relative abundance of each grass is represented by the following signs:—P=predominant, A=abundant, C=common.

The order of the tables indicates a progressive improvement in the quality of the herbage, and the order of the particular

pastures in each table represents, so far as this can be done in a linear series, my estimate of their relative values.

The number prefixed to each pasture refers to the number of the pasture in the list of districts already given.

1. Pastures in which Yorkshire Fog predominates.

Yorkshire fog may be considered to be nothing else than a weed. Cattle refuse it in all stages of its growth unless when driven to it by hunger in the absence of any other food. Even as hay it is disliked. Yorkshire fog has a considerable quantity of foliage which spreads from the crown of the root and the stem amongst the neighbouring plants, with this result, that the stock, in rejecting the woolly leaves of the *Holcus*, reject also the desirable leaves with which they are intermingled. It produces abundance of seed which is light and easily carried by the wind, so that it spreads widely and increases rapidly. It is very difficult to eradicate from any field where it has once got a foothold. Ploughing and thorough cleaning is the only remedy.

TABLE I.—PREDOMINANT GRASS—YORKSHIRE FOG.

No.	Pasture	Cocksfoot	Meadow fescue	Foxtail	Timothy	Rough-stalked meadow-grass	Yellow oat-grass	Rye-grass	Floria	Hard fescue	Dogstail	Tall oat-grass	Sweet vernal	Squirrel-tail	Haesock-grass	Brome-grass	Yorkshire fog	Clover	Yarrow	Rib-grass
13	Pandean . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55	East Field . .	C	—	—	—	—	—	A	A	—	A	—	—	—	—	—	—	—	—	—
56	West Field . .	C	—	—	—	C	—	A	A	—	A	—	C	—	—	—	—	—	—	—
49	Meldon Ist . .	C	—	—	—	C	—	A	A	—	A	—	C	—	—	—	—	A	C	—

P, predominant. A, abundant. C, common.

There can scarcely be a more worthless pasture than one largely composed of Yorkshire fog. The value of these four pastures is derived from the presence of other useful plants in them. In Pandean the clover was abundant, and at Meldon not only was there clover, but also a considerable quantity of baitable grasses. The presence of such grasses gave the two pastures at Swinhoe [55 and 56] their value.

2. Pasture in which Squirrel Tail predominates.

The predominant grass over the famous pastures of Pawlett Hams is squirrel-tail. The squirrel-tail was well eaten down,

but the chief bents, or seeding heads, belonged to this grass; and of course the long sharp awns with which the head is so abundantly furnished prevented the stock from touching it when it had reached this stage. In its earlier life, it produces a considerable quantity of foliage, and cannot be ungrateful to stock, for sheep and cattle prosper on pastures in which it abounds, not only at Pawlett Hams, but in other districts of the country.

TABLE II.—PREDOMINANT GRASS—SQUIRREL TAIL.

No.	Pasture	Ockalfoot	Meadow fescue	Foxtail	Timothy	Rough-stalked meadow-grass	Yellow oat-grass	Rye-grass	Florin	Hard fescue	Dogstail	Tall oat-grass	Sweet vernal	Squirrel-tail	Hassock-grass	Brome-grass	Yorkshire fog	Clover	Narrow	Kib-grass
16	Pawlett Hams	—	—	—	—	—	—	A	—	—	A	—	—	P	—	—	—	A	—	—

P, predominant. A, abundant. C, common.

Here the power of the pasture to carry an exceptionally large quantity of stock is no doubt due to the rich and well-watered soil, which supports a vigorous vegetation. The nutritive value of the grass depends upon the quantity of protoplasm and starch present in the tissues; and the quantity of these food-substances depends on the quality of the soil. The best grass on a poor soil, struggling for its own life and scarcely able to lay up starch for its seeds, is of small feeding value compared with the same grass grown on a rich soil. The difference between the feeding value of the two grasses is something like the difference in the feeding value of a lean bullock and the same bullock after it has been fed and fattened for the butcher. Even the poorer grasses on a rich soil will provide better food than the best grasses on poor soil. But how much more valuable would these rich lands be, if the herbage were of a better quality; if, instead of squirrel-tail, dogstail, and rye-grass, Pawlett Hams were covered with fescues, foxtail, and meadow-grasses?

3. Pastures in which Yorkshire Fog and Florin predominate.

These meadows, on rich loamy soils, do not supply the amount of food that they are capable of, because of the quality of the herbage upon them. The poverty of the pasture is greatly modified by the presence of so large a quantity of florin, and by a varying proportion of other grasses and of clovers.

TABLE III.—PREDOMINANT GRASSES—YORKSHIRE FOG AND FIORIN.

No.	Pasture	Cocksfoot	Meadow fescue	Foxtail	Timothy	Rough-stalked meadow-grass	Yellow oat-grass	Rye-grass	Fiorin	Hard fescue	Dogtail	Tall oat-grass	Sweet vernal	Squirrel-tail	Hassock-grass	Brome-grass	Yorkshire fog	Clover	Yarrow	Rib-grass
48	Fatting Close	—	—	—	—	—	C	A	P	—	A	—	—	—	—	—	—	—	—	—
52	Angerton . .	C	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
53	Whittingham	C	—	—	—	—	C	—	—	—	—	—	—	—	—	—	—	—	—	—
47	Halton, 1st .	C	—	—	C	—	A	—	P	—	C	—	—	—	—	—	—	—	—	—
44	The Tofts . .	A	—	—	—	—	C	A	P	—	—	—	—	—	—	—	—	—	—	—
58	Milburn Bank	A	—	—	—	—	A	A	P	—	A	—	—	—	—	—	—	—	—	—

P, predominant. A, abundant. C, common.

4. Pastures in which Yorkshire Fog, Fiorin, and Dogtail predominate.

Dogtail, though placed by many writers among the best pasture grasses, is acknowledged by all to produce but little foliage. Gorrie, a careful observer and practical agriculturist, rightly estimates its value when he says that it yields "a comparatively scanty supply of innutritious herbage, which is not liked by any kind of stock; and unless pastures where it predominates be barely eaten down in the early part of the season, when its stems are tender, these attain to a height of twelve or eighteen inches, and become rigid, dry 'windle straws,' which both injure and disfigure the autumn and winter verdure." Dogtail is one of the so-called fine grasses, and looks as if it ought to be a favourite with stock, but the presence in autumn of so many of its bents in all pastures where it abounds is the plainest testimony that it is rejected as food. Had the leaves been eaten down, the flowering stalks would not have been produced. No doubt it has, as chemical analysis shows, high

TABLE IV.—PREDOMINANT GRASSES—YORKSHIRE FOG, FIORIN, AND DOGSTAIL.

No.	Pasture	Cocksfoot	Meadow fescue	Foxtail	Timothy	Rough-stalked meadow-grass	Yellow oat-grass	Rye-grass	Fiorin	Hard fescue	Dogtail	Tall oat-grass	Sweet vernal	Squirrel-tail	Hassock-grass	Brome-grass	Yorkshire fog	Clover	Yarrow	Rib-grass
10	Killerton . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50	Meldon 2nd .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
11	Ere Meadows	C	—	C	C	C	—	—	—	—	—	—	—	—	—	—	—	A	—	—

P, predominant. A, abundant. C, common.

nutritive value, but when stock do not eat the plant, they cannot utilise its nutritious properties. In closely grazed pastures dogstail is eaten, like other grasses which are rejected when the stock has a sufficient supply of baitable food to permit of a choice. In the majority of our pastures, unfortunately, the ripe seed-heads secure the rapid increase of a good-looking but useless grass wherever it gets a place.

5. Pasture where Fiorin and Hassock-grass predominate.

The hassock-grass is rightly looked upon as a most objectionable plant in pastures. Its long, hard, and harsh leaves, with edges so sharp that they cut the fingers when roughly drawn along them, are disliked by cattle, and in careful husbandry the hassocks are uprooted and destroyed.

TABLE V.—PREDOMINANT GRASSES—FIORIN AND HASSOCK-GRASS.

No.	Pasture	Cocksfoot	Meadow fescue	Foxtail	Timothy	Rough-stalked meadow-grass	Yellow oat-grass	Rye-grass	Fiorin	Hart fescue	Dogstail	Tail oat-grass	Sweet vernal	Squirrel-tail	Hassock-grass	Brome-grass	Yorkshire fog	Clover	Yarrow	Rib-grass
45	Castle Field	C	—	—	C	—	—	A	P	—	C	—	—	—	P	—	A	A	—	—

P, predominant. A, abundant. C, common.

In this field the hassock-grass, which made up a large proportion of the pasture, was freely eaten, and the cattle were in good condition. It may be that there is in the pasture a scarcity of palatable food, and that the hassock-grass afforded as agreeable a mouthful as the fiorin, Yorkshire fog, or rye-grass of which the pasture was otherwise chiefly composed. No doubt the clover, which formed a good bottom to the pasture, accounted to some extent for the good condition of the cattle.

6. Pastures in which Fiorin predominates.

There are two species of *Agrostis* found in pastures; the one (*Agrostis vulgaris*, L.), popularly known as common bent or black twitch, is frequent in dry pastures; and the other (*A. alba*, L.), called fiorin or marsh-bent, is very frequent in wet meadows. Both species are stoloniferous—that is, they have creeping wiry stems that stretch out sometimes several feet from the parent plant and, taking root at the joints, give rise to new plants.

This is specially the case with the florin, which in many meadows so overruns the ground with these rooting stems as to prevent the growth of better grasses. When there is a choice of food, the cattle do not select florin, but it is nevertheless a useful plant in soils which are not favourable to the growth of other grasses. It makes also a fair quality of hay. Florin flourishes all the year round, but is specially an autumn grass.

TABLE VI.—PREDOMINANT GRASS—FIORIN.

No.	Pasture	Cocksfoot	Meadow fescue	Boxtail	Timothy	Rough-stalked meadow-grass	Yellow oat-grass	Rye-grass	Florin	Hard fescue	Dogstail	Tall oat-grass	Sweet vernal	Squirrel-tail	Harcock-grass	Brome-grass	Yorkshire fog	Clover	Yarrow	Rib-grass
1 & 2	Preston Place	—	—	—	—	—	—	A	P	—	—	—	—	—	—	—	A	—	—	—
27	Stilton, 2nd	—	—	—	—	—	—	A	P	A	A	—	—	—	—	—	A	A	—	—
36	Stilton, 1st.	C	—	—	—	—	—	A	P	A	—	—	—	—	—	—	A	A	C	—
40	Farm Ask	—	—	—	C	—	—	A	P	—	C	—	C	—	—	—	A	A	—	—
51	Meldon, 3rd	C	—	—	—	—	—	—	P	—	C	—	—	—	C	—	A	A	—	—
22	Severn Valley	—	—	C	C	—	—	A	P	—	—	—	—	—	C	—	A	—	—	C
28	Inttingham	C	—	—	C	—	—	A	P	—	C	—	—	—	—	—	A	A	—	—
4	Arun Valley, 2nd	C	—	—	—	—	—	A	P	—	C	—	—	—	—	—	A	A	—	—
35	Sugar Hills	A	—	—	—	—	—	C	P	A	C	—	C	—	—	—	A	A	C	—

P, predominant. A, abundant. C, common.

The two valuable pastures at Preston Place had a fair quantity of rye-grass and Yorkshire fog, but their feeding value was due to the vigorous growth of the florin, which was by far the most abundant ingredient. The two meadows at Stilton differed little except that in the one there was a fair admixture of timothy and cocksfoot, which were wanting in the other. The best of the florin meadows that I visited was the Sugar Hills field at Duncombe Park, where there was a good deal of cocksfoot, hard fescue, and clover. The presence of the Yorkshire fog, generally in considerable quantity, in all these pastures except that of the valley of the Arun, is a serious detriment.

7. Pastures in which Rye-grass predominates.

There can be no doubt that rye-grass is preferred as a food to dogstail, if we accept the testimony of the autumn bents as an evidence of the rejection of plants by stock. The number of bents in proportion to the quantities of rye-grass and dogstail in a pasture is much greater for the dogstail. But there may always be found a number of ripe heads of rye-grass in pastures where this grass occurs, and as no flowering stalk can appear unless the stock, in its feeding, has passed over the individual plant, it is obvious that rye-grass is not a favourite food.

TABLE VII.—PREDOMINANT GRASS—RYE-GRASS.

No.	Pasture	Cocksfoot	Meadow fescue	Foxtail	Timothy	Rough-stalked meadow-grass	Yellow oat-grass	Rye-grass	Florin	Hard fescue	Dogstail	Tall oat-grass	Sweet vernal	Squirrel-tail	Hussock-grass	Brome-grass	Yorkshire fog	Clover	Yarrow	Rib-grass
31	Sproxtton . .	—	—	—	—	—	C	P	—	—	C	—	—	—	—	—	A	—	—	C
42	Blue Gate . .	—	—	—	C	—	C	P	A	—	C	—	—	C	—	—	A	—	—	—
29	Humber Alluvium	—	—	—	—	—	—	P	—	—	C	—	—	—	—	—	A	A	—	—
30	The Fulkins .	A	—	—	—	—	C	P	—	—	C	—	C	—	—	—	A	A	—	C

P, predominant. A, abundant. C, common.

8. Pastures where Rye-grass predominates along with other Grasses.

The two following tables comprise pastures which are superior to those placed in Table VII., because of the presence of a greater variety of grasses, some of them of superior quality.

TABLE VIII.—PREDOMINANT GRASSES—RYE-GRASS AND DOGSTAIL.

No.	Pasture	Cocksfoot	Meadow fescue	Foxtail	Timothy	Rough-stalked meadow-grass	Yellow oat-grass	Rye-grass	Florin	Hard fescue	Dogstail	Tall oat-grass	Sweet vernal	Squirrel-tail	Hussock-grass	Brome-grass	Yorkshire fog	Clover	Yarrow	Rib-grass
57	Tughall . . .	C	—	—	—	—	C	P	A	—	P	—	C	—	—	—	A	—	—	—
8	Bulbridge . .	—	—	—	—	—	C	P	C	—	P	—	—	C	—	—	A	—	—	—
6	Arun Valley, 4th	C	—	—	C	—	—	P	—	—	—	—	—	—	—	—	C	A	—	—
18	Dairy Pasture	A	—	—	—	—	—	P	—	C	P	—	—	—	—	—	A	A	—	—

P, predominant. A, abundant. C, common.

TABLE IX.—PREDOMINANT GRASSES—RYE-GRASS AND FLORIN.

No.	Pasture	Cocksfoot	Meadow fescue	Foxtail	Timothy	Rough-stalked meadow-grass	Yellow oat-grass	Rye-grass	Florin	Hard fescue	Dogstail	Tall oat-grass	Sweet vernal	Squirrel-tail	Hussock-grass	Brome-grass	Yorkshire fog	Clover	Yarrow	Rib-grass
28	Town Meadow	—	—	—	—	—	—	P	P	C	—	—	—	—	—	—	A	—	—	—
54	Swinhoe . . .	—	—	—	—	—	C	P	P	—	C	—	—	—	—	—	A	A	—	C
24	Parrot's Close	—	—	—	—	—	—	P	P	—	—	—	—	—	—	—	A	A	—	—
23	Newton's Field	—	—	—	—	—	—	P	P	—	—	—	—	—	—	—	A	A	—	—
27	Casthorpe	—	—	—	—	—	—	P	P	—	C	—	—	—	—	—	A	A	—	—
26	Abbey Field	—	—	—	—	—	—	P	P	—	—	—	—	—	—	—	A	A	—	—
43	Barton Closes	—	—	—	—	—	—	P	P	—	—	—	—	—	—	—	A	A	—	—
21	Newnham . .	C	—	—	—	—	—	P	P	—	—	—	—	A	—	—	A	A	—	—

P, predominant. A, abundant. C, common.

9. Pasture in which Meadow Fescue, Florin, and Yorkshire Fog predominate.

Meadow fescue was observed in quantity in only three of the pastures examined (Tables IX., X., XIV.), and in only one

of them (Table X.) did it form a predominant element. It is remarkable how rare this grass is in these natural pastures. According to the statistical method of determining the value of a grass, meadow fescue should be excluded from all mixtures for laying down permanent pasture. Yet its excellences are so fully recognised that it is included in all such mixtures.

TABLE X.—PREDOMINANT GRASSES—MEADOW FESCUE, FLORIN, AND YORKSHIRE FOG.

No.	Pasture	Cocksfoot	Meadow fescue	Portul	Timothy	Rough-stalked meadow-grass	Yellow oat-grass	Rye-grass	Florin	Hard fescue	Degsiall	Tall oat-grass	Sweet vernal	Squirrel-tail	Hussock-grass	Brome-grass	Yorkshire fog	Clover	Yarrow	Rib-grass
59	The Park . .	A	P	—	—	—	A	A	P	A	—	—	C	—	—	—	P	C	—	—

P, predominant. A, abundant. C, common.

10. *Pastures where Cocksfoot predominates, alone or with other grasses.*

The terms coarse and fine, as applied to grasses, have introduced much error into the estimate of their value. Many fine grasses are of little or no value in meadows, while some valuable grasses have been rejected because they are coarse. And no grass has had its character more traduced by the application to it of the term "coarse" than cocksfoot. Curtis excludes it from his list of best grasses, and represents it as a rough, coarse, hardy, early, and productive grass. His editor, John Lawrence, in the fifth edition (1812), says that it "has, of late years, become a favourite object of culture, as a separate grass, with some eminent and extensive farmers, on account of its certainty of growth, early use, abundant quantity, and accommodation of itself to almost all sorts of soils. It is necessary, as with all coarse grasses, to feed or cut early, and most particularly on rich and moist soils; with which precaution, the cocksfoot, being young, tender, and juicy, is said not only to be very nutritious, but well affected by all sorts of cattle. Its second product is to be depended upon for quantity." These diverse views persist in our own day. In some places cocksfoot is treated as a pest, to be eradicated, in others esteemed as the most valuable grass in the pasture. It is certain that the best pastures on medium soils that I have examined throughout England have owed much of their feeding value to the presence of cocksfoot in considerable abundance. Whenever a field was fairly stocked, and the

soil not exceptionally rich, there were no complaints against this grass. The value of pastures in which cocksfoot predominates, and therefore their position in the tables, is influenced by the quality of the other grasses and the clovers associated with it.

TABLE XI.—PREDOMINANT GRASSES—COCKSFOOT, RYE-GRASS, AND YORKSHIRE FOG.

No.	Pasture	Cocksfoot	Meadow fescue	Portulac	Timothy	Rough-stalked meadow-grass	Yellow oat-grass	Rye-grass	Fiorin	Hard fescue	Dogstail	Tall oat-grass	Sweet vernal	Squirrel-tail	Blascock-grass	Bromus-grass	Yorkshire fog	Clover	Yarrow	Rib-grass
62	Harleston . . .	P	—	—	—	—	C	P	A	—	A	—	—	—	—	—	P	A	—	—
39	Nunnington . . .	P	—	—	C	—	—	P	—	—	C	—	—	—	—	C	P	A	A	—

TABLE XII.—PREDOMINANT GRASSES—COCKSFOOT AND FIORIN.

41	Newton Morell . .	P	—	—	C	—	C	C	P	—	—	—	—	—	C	—	A	C	C	C
60	Valley Meadows .	P	A	—	—	—	A	A	P	P	—	A	—	—	—	—	A	A	—	—
34	High Griff. . . .	P	—	—	—	—	C	A	P	P	C	C	—	—	—	—	A	—	—	—
32	Cascade	P	—	—	—	—	C	—	P	C	C	—	—	—	—	—	—	—	—	—

TABLE XIII.—PREDOMINANT GRASSES—COCKSFOOT WITH OTHER GRASSES.

33	The Park	P	—	—	—	—	C	C	P	P	—	—	C	—	—	—	C	A	—	—
9	Oricket St. . . .	A	—	—	A	—	—	A	—	—	—	A	—	—	—	—	A	A	—	—
	Thomas	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	Arun Valley, 1st .	A	—	—	A	—	—	A	A	—	—	A	—	A	—	—	—	—	—	—
26	Oatfield	A	—	—	A	—	—	A	A	C	—	A	—	—	—	—	A	A	A	—
5	Arun Valley, 3rd .	P	—	—	P	—	—	C	P	—	—	P	—	C	—	—	A	—	—	—
19	Ingfield	P	—	—	P	C	C	P	C	—	—	C	—	—	—	—	C	A	C	—
12	Little Bray . . .	P	—	—	P	—	—	A	—	C	—	A	—	—	—	—	A	A	—	—

TABLE XIV.—PREDOMINANT GRASS—COCKSFOOT.

63	Worley's Close . .	P	—	—	—	—	C	—	—	—	—	—	—	—	—	—	A	A	A	—
46	Beaufront	P	—	—	—	—	C	—	—	A	—	C	—	—	—	—	A	A	A	—
17	Hall Close	P	—	—	—	—	—	A	A	—	—	—	—	—	—	—	A	A	A	—
61	Brampton	P	—	—	A	—	—	A	C	—	—	A	—	C	C	—	A	A	A	C
7	Arun Valley, 5th .	P	—	—	C	—	—	—	—	—	—	—	—	—	—	—	A	A	A	—
20	South Lawn . . .	P	—	—	C	—	C	C	C	—	—	C	—	—	—	—	A	—	—	C
14	Lydcott	P	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
13	Quarry Field . . .	P	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

P, predominant. A, abundant. C, common.

The most obvious deduction from the preceding tables is that the feeding value of a pasture depends more on the quality of the soil than on the nature of the herbage of which it is composed. None of the pastures inspected approach, in feeding powers, those at Pawlett Hams, near the mouth of the Parret; and yet the grasses which form the great mass of the herbage there are of second-rate value. On a medium soil they would produce a very poor pasture. One cannot fail to be im-

pressed with the inferior quality of the grasses that make up the herbage in a large number of these famous pastures. In some of them, no doubt, the most fitting grass has, by Nature's selection, secured a leading place, as in the case of florin; but too frequently a useless grass, because rejected by the stock, has taken possession of the soil, as in the case of Yorkshire fog. It is the proper work of the cultivator to clear his pastures of such intruders, and to replace them by the better grasses. This operation would add immensely to the feeding capabilities of our pasture lands. I am happy to be able to add that the owners of several pastures where Yorkshire fog abounds have agreed to undertake experiments for the purpose of supplanting it with the better grasses.

WM. CARRUTHERS.

THE TRIALS OF CIDER-MAKING PLANT AT GLASTONBURY.

Two prizes, of 20*l.* and 10*l.* respectively, were offered in the Implement Department at the Plymouth Meeting for "Plant for Cider-making, suitable for use on a Farm," and five competitors appeared at the Show; but the Judges, after an examination, reported their inability to form any conclusions as to the relative merits of the machines exhibited without an actual trial with apples. No fruit being available in June, the Council resolved that the trials of cider-making plant should be deferred until autumn, and then take place in some cider-making district to be selected later. In the result, and upon the invitation of Mr. R. Neville Grenville, a Member of Council residing in the neighbourhood, the town of Glastonbury was settled upon, Mr. Neville Grenville most kindly undertaking all necessary preparations for the conduct of the experiments, and furnishing engine-power, from his own workshops, for driving the machinery. In addition, Mr. Grenville extended the hospitality of his house to the representatives of the Society, who, becoming his guests at Butleigh Court, have to thank him, not only for his admirable arrangements in regard to the trials themselves, but for the most agreeable hospitality which a host could offer or guests enjoy.

Indeed, the whole surroundings of the cider plant trials were almost idyllic in character. They took place in that

"island valley of Avilion,
Where falls not hail, nor rain, nor any snow,
Nor ever winds blow loudly, but it lies
Deep meadowed, happy, fair with orchard lawns,
And bowery hollows, crowned with summer sea,"

within the precincts of Glastonbury Abbey, and hard by the kitchen of the great ruined monastery, itself scarcely injured by the lapse of five centuries since Abbot Breynton's cooks first served its four gigantic fireplaces, and before the evil days when Thomas Cromwell's iron hand fell, at the bidding of Henry's appetites, upon the monasteries of England.

"Sir," said one of the unexpectedly numerous visitors, attracted to an exhibition which proved full of local interest, "I pay a yearly visit to, and am greatly interested by your splendid annual country meetings; but I would cheerfully give up all coming Shows of the Royal Agricultural Society of England if, instead, I might see Glastonbury Abbey once again in working order, and tenanted, as before the Reformation, by Abbot, Prior, and Monks."

Even in decay, these great ecclesiastical buildings appeal to the least imaginative mind, and the speaker in question was, probably, not the only man who, cider-mug and bread and cheese in hand, found the "Abbot's kitchen," appropriately serving as a refreshment-room during the trials, suggestive of speculation as to what agricultural England was like when, Feudalism being discrowned, the Church was both king and landlord in Britain, while Industrialism, the present reigning monarch, was, as yet, an impossible dream.

No slugs in the service of agriculture (Thomas Cromwell's Commissioners of Inquiry notwithstanding) were the Glastonbury monks at one period of their career,—witness the labours which, embanking the river Brue, previously in almost perpetual flood, reclaimed the "Island of Apples" itself from a swamp, and laid the foundations of what is, now, some of the richest pasture land in the West of England.

And did they make cider, too, they of the

"good bellyful,
The warm serge, and the rope that goes all round"?

Yes—and that, probably, by means of machinery easily matched in Somersetshire to-day, but, probably also, of a quality now only to be found in "Maister's bar'l." And how do their ghosts regard that "science" which has harnessed the "divil's oan teām" to the row of mills and presses marshalled beside the "Abbot's kitchen," or these moderns, in grey suits and pot-hats, "weighing and measuring," with chronograph and indicator, the performances of each machine? Much, probably, as the

"Zummerzet" of to-day thinks and speaks, in the hearing of all men, of the winning machines and their sweating attendants. "This b'aint zider-makin', I tell 'ee; this here be tur'ble haard wurk." Alas for the change from the "good old times," before the tyrant Industrialism was crowned King of England! The devil takes the hindmost everywhere now except—does one hope, or dream?—in the dear old West Country, where "it is always afternoon," and where, fit or unfit, the delicious "easy all" of later monkish days, thank God, survives. But it is time to turn from monasteries and monks to the business of the Royal Agricultural Society, from dreaming to doing.

Four out of the five sets of cider-making plant entered for trial at Plymouth put in an appearance at Glastonbury, and if the fifth—Ladd's Mill and Press—were absent, this was so exclusively designed for private use that the competition lost nothing in practical interest by its absence.

CONDITIONS OF TRIAL.

The subjoined points of merit were determined by the Steward and Judges in consultation before the trials commenced.

	Mill	Press
1. Power absorbed per unit of work performed	20	15
2. Time occupied	10	10
3. Efficiency	20	25
4. Mechanical construction	10	10
5. Attendance required	10	10
6. Price	10	10
Total	80	80

The judges appointed by the Council were:—

F. J. HAYES, The Elms, West Pennard, Glastonbury.

DAN. PIDGEON, C.E., Walsingham House, Piccadilly.

The following machines competed, and their trials will, for convenience sake, be described in the order given below instead of in their actual sequence.

Description	Makers' names and addresses	Catalogue number	PRICE					
			Mill			Press		
POWER PLANT	Dening & Co., Crimchard Works, Chard	2369-70	£	s.	d.	£	s.	d.
	Workman & Sons, Slimbridge, Gloucestershire.	2361	17	10	0	38	0	0
HAND PLANT.	Workman & Sons, Slimbridge, Gloucestershire.	2363	19	0	0	19	10	0
	Joseph Bamber, Saul Street, Preston	2364	11	0	0	15	0	0
			11	0	0	14	0	0

POWER PLANT.

Dening's Power Plant came first to trial in the forenoon of October 15, the mill receiving fifteen bags, or 2,250 lb., of apples, and starting to grind at 10.24 A.M. After working 25 minutes, a small piece of limestone, entering with the apples, locked the feed-rollers and caused the breakage of two teeth in one of the gear wheels driving the crushing rolls, thus putting the mill *hors de combat*. Eighteen hundred pounds of apples had already been crushed when the accident occurred, at the rate of 100 lb. per 1.4 minutes, but the work was not well done, many pips escaping whole from the mill in consequence of the springs (which, as in roller mills generally, are provided to allow of the harmless passage of hard foreign substances through the rolls) being too weak.

Great stress is laid by cider-makers on the question of crushing the apple pips, since when this is properly accomplished the ratafia-like essence contained in the seeds diffuses itself throughout the mass of apple-pulp, and gives highly-valued flavour to the subsequent brew.

Dening's crushing rolls are of granite, 15 in. diameter, by 15 in. long, and ran, during the trial, at differential speeds of 65 and 130 revolutions per minute respectively. It was found impossible to measure accurately, by means of the indicator, the absolute amount of energy consumed either in this or any of the other mills. In some cases, it was too small, in others, too irregular; the fly wheel of the engine, in the latter case, being as often driver as driven. But enough was learned to enable the Judges accurately to grade all the competitors, although they are not in a position to state the consumption of energy in units of power.

The feed of Dening's mill consists of a pair of deeply and sharply fluted rollers, which first break up and then deliver the apples to the crushing rolls. They ran, during the trial, at 85 revolutions per minute, and were fairly effective in action, but became locked, as before stated, by the entry of a piece of stone (a common occurrence in practice) causing a fracture in the roller gearing. The latter, it must be remarked, was often much too shallow in gear, the consequence of using relieving springs of insufficient strength, and it may well be that the teeth, which appeared amply strong for their work, were thus caught at a disadvantage at the moment when the mishap occurred.

While one man fed, another man removed the pulp from the mill to the press, where other two men built it into a "cheese." This process is eminently characteristic of Somerset.

shire practice, and is probably of very ancient origin. A layer of pulp, some three inches thick, was first spread evenly over the floor of the press. This was then lightly covered with reed-straw, and a second layer of crushed apples added, the process being repeated, again and again, until some eight or nine "cakes" of pulp had accumulated, when the platen was lowered and pressing began. The operation of building the "cheese" is a skilled one. Each cake is made of slightly smaller dimensions than the preceding one, so that the structure takes the shape of a low truncated pyramid, the object being to avoid deformation of the cheese edges on the application of pressure.

Actual pressing began at 11.10 A.M., and was completed at 1 o'clock, a period of 1 hr. 50 min., during which time, however, the platen was raised three times, and the edges of the cheese thrice "pared" true and square. Each time, the sheared fragments were thrown on the top of the cheese, and the pressure reapplied until all the juice had been expressed, and the remaining "pomace" took the form of a solid, coherent cake, easily reducible by the knife into blocks of a size and weight handy for transport to the cattle yard. The quantity of juice produced from 1,800 lb. of apples by Denning's press was 106 gallons, equal to 5.9 gallons expressed in 6.1 minutes from each 100 pounds of fruit.

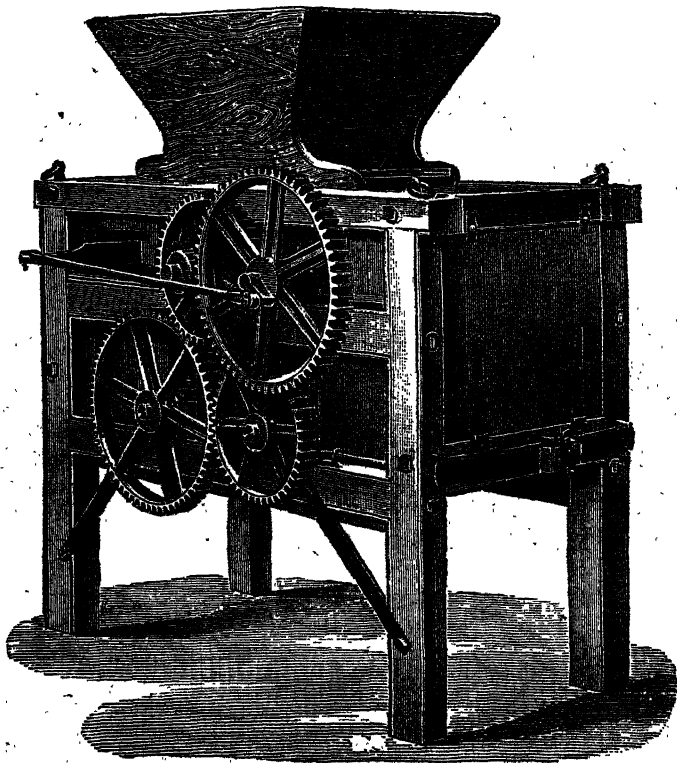
Denning's press consists of a strong wooden frame with a channelled bed, and a platen which is depressed by the action of two screws, turned somewhat rapidly, at first, by means of a winch and gear, more slowly, later, by the application of a long lever directly to each of the screws, and, slowest of all, by the use of the same lever operating with the advantage of gearing having a ratio of some five to one.

The question of the amount of power absorbed by a cider-press is not of any practical moment, and did not come under review, except in the most general way, in this competition. In Somersetshire, it is thought best that the process of pressing should be intermittent, and occupy some considerable time. Whether this belief has or has not arisen from its fitting in well with the somewhat crude character of the presses commonly used in the "Island of Apples," it is certainly the practice to put up a "cheese" one day and let it stand all night before giving it the final squeeze. Since, however, no very definite logical grounds were forthcoming in support of this local custom, the Judges were compelled to allot more points to machines, equally efficient with, but more expeditious than the Denning press. Whether fast or slow pressing be adopted, there are

always, at least, two men about a cider mill, who easily supply all the energy required where cider-making is carried on as a business *per se*, while still less power is demanded in the case of a farmer pressing for home consumption.

Workman and Sons' Power Plant.—The mill received fifteen bags, or 1,800 lb., of apples at 2.47 P.M., and finished its work in 23 minutes, or at the rate of 100 lb. of apples per 1.3 minute.

Workman's Apple Mill.



It must, however, be remarked that this machine ran idle for at least a third of the time, the one man employed at the press being unable to deal with the pulp as fast as the mill supplied it. Indeed, Workman could have bettered a first-rate performance by employing two men at the press and one man at the mill, instead of two altogether; the points gained under the head of "attendance" being more than lost under the head of "time."

The mill consists of a pair of rollers $14\frac{1}{2}$ in. diameter by 18 in. long, constructed of "Pennant" stone, a material which preserves a rough surface in work. These ran, during the trial, at differential speeds of 175 and 350 revolutions per minute respectively, and were fitted with a strong "carriage-spring" attachment, securing the harmless passage of hard foreign substances through the mill.

The feed is peculiar and effective. It consists of a single wooden roller, thickly set with wrought-iron studs, and revolving 250 times per minute in close apposition to a horizontal metal plate. In addition, there is a wooden plunger which, now approaching, and now retreating from the feed roll at the rate of 50 reciprocations a minute, first admits, and then presses, the entering apples against the roller. This was the best feed on the ground, leaving nothing to be desired either in its operation or in its adjustment; but, as before hinted, its intermittent action was fatal to the accurate measurement, by an indicator, of the power absorbed by the mill, notwithstanding which it was clear that, of the two machines, Workman's was lighter in draught than Denning's.

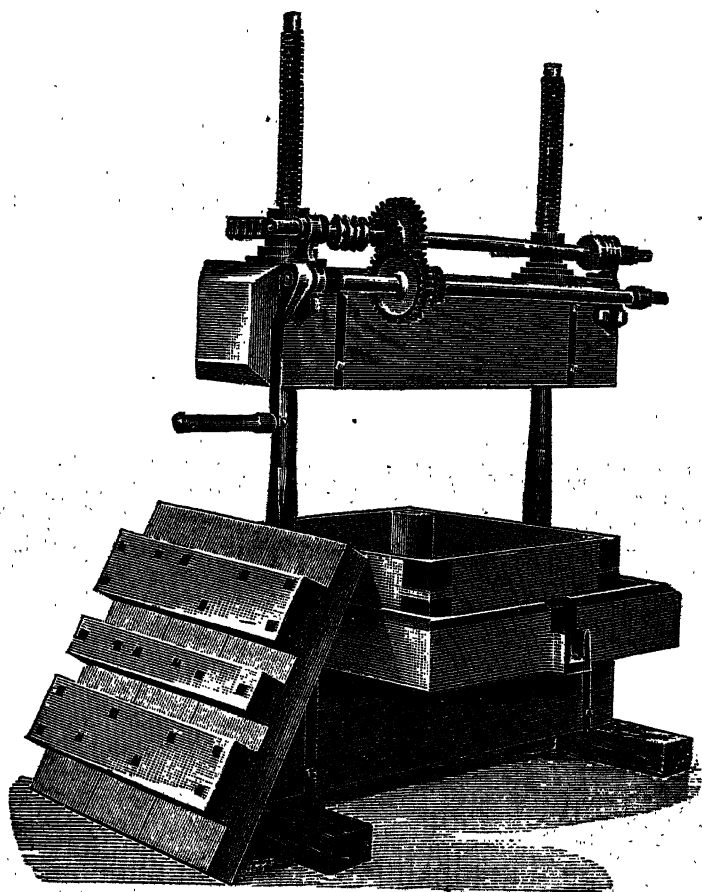
Workman's mill produced an excellent sample of pulp, the flesh of the fruit being well separated from the rind, and the pips crushed in a very satisfactory manner.

As in Denning's case, Workman began to charge his press as soon as the mill got into operation, but using an essentially different process. No "cheese," properly so called, was built; but the bed of the press having been first covered by a canvas cloth of open mesh, this received a layer of pulp some two or three inches thick, which was then completely inclosed by folding the cloth. A "former," or wooden frame of suitable size and shape, was next dropped over the "cake" thus produced, and a second canvas laid therein. A second layer of apple pulp and a second inclosing sheet followed, the "former" serving to size each cake, and so on, until all the pulp had been disposed in some eight or nine "cakes." Actual pressing began at 3.15 P.M. and was completed in 39 minutes, while the quantity of juice produced from 1,800 lb. of apples was 108 gallons, equal to 6 gallons expressed in 2.17 minutes from each 100 lb. of fruit.

Workman's press consists of a strong wooden frame having a channelled bed for the reception of pulp, and a platen depressed by the action of two screws, operated by means of a winch-handle, acting, through a neat system of change-speed gearing, upon two worms and worm-wheels, the latter forming nuts for the press-screws. This arrangement worked extremely well, and is much more convenient to handle than the shifting levers of Denning's press. It was competent for either of the men to

give an occasional turn to the handle at any odd moment, intermittently with scooping pulp and dipping juice, while the fact that, from the same quantity of apples, Workman got rather more juice than Denning, in a third of the time, while em-

Workman's Cider Press.



ploying half the labour, affords striking evidence of superiority in the press.

The "pomace" from Workman's press cannot, of course, be cut up into blocks, as in Somersetshire practice; but it did not, in the Judges' opinion, appear less well adapted for cattle food, or for transport, than the sheared cakes of pomace.

The question of cleanliness, involved in the use of pressing cloths, must, probably, be resolved in favour of reed-straw as against canvas, since washing is dispensed with in the former case, while it is a necessary part of Workman's system. There is also the question of comparative cost, reed-straw being, of course, cheaper than the cloths, but neither consideration weighs much against the solid advantages which the Gloucestershire men appeared to the Judges to have established for their system. This plant, comprising mill and press, was awarded the First Prize.

HAND-POWER PLANT.

Workman's Hand-power Plant consists of a mill and press, similar in construction to, but smaller in size than, his power plant, the mill, however, being furnished with a different feed. This consists of a wooden roller closely set with wrought-iron studs, which pass at every revolution through a horizontal row of similar studs forming a fixed portion of the mill. There is no plunger, as in the power-mill feed, the apples falling from the hopper through an adjustable slide direct to the feed roll, which first breaks and then delivers them to the crushing rolls. This arrangement is not quite so effective as the "plunger" feed already described, but was much superior to that of any other mill.

The machine received 900 lb. of apples at 1.4 P.M., and finished grinding in 17 minutes, or at the rate of 1.88 minutes per 100 lb. of fruit, while the press was started at 2.7 and completed its work in 16 minutes. The total quantity of juice produced was 55 gallons, equal to 6.1 gallons expressed in 1.77 minutes from each 100 lb. of apples. This plant, comprising mill and press, was awarded the Second Prize.

Bamber's Hand-power Plant departed rather widely in method from the common practice of cider-pressing, and was consequently regarded with a good deal of interest by the practical cider-makers present at the competition.

His mill received 900 lb. of apples, and started grinding at 11.58 A.M., the work being finished in 47 minutes, or at the rate of 5.22 minutes for every 100 lb. of apples. This apparently slow rate of grinding resulted from the method employed, which, for the sake of clearness, must next be described. So far as grinding is concerned, Bamber makes his pulp much like other people, but instead of building a "cheese," like Denning, or pressing between cloths, like Workman, he hangs a sack under his mill rolls, and, when this is full, removes it, with the aid of the man employed

in feeding the apples, to the bed of his press. Then, while the feeder returns to his work and fills a second sack, the pressman lowers the platen upon the bag of pulp in the press, and squeezes as much juice out of it as he can before sack No. 2 is ready to come forward. When this is the case, he raises the platen quickly, by means of a special apparatus, to be hereafter described, throws sack No. 2 upon sack No. 1, and again brings down the platen. This operation is repeated until some five or six bags have accumulated in the press, when they, all together, receive their final squeeze.

In the case under review, the sacks were filled, and followed one another into the press at intervals averaging ten minutes' duration, so that each bag received ten minutes' independent squeezing, upon a bed growing less hard with every added sack, before the mass was pressed as a whole. The first bag was put in the press at 12.9 P.M., and the fifth, and last, at 12.50, or forty-one minutes after the first; but pressing was not completed until 2 o'clock, or in 1 hr. 51 min., being at the rate of 12.33 minutes for every 100 lb. of fruit pressed.

Sixty-two gallons of juice were thus produced from 900 lb. of apples in one hour and fifty-one minutes, equal to 6.9 gallons extracted from each 100 lb. of fruit in 12.33 minutes. The larger output of juice was no doubt due, first, to the system of piecemeal pressing, and, next, to its long continuance. Bamber, apparently, took no account of time, but only concerned himself to obtain a maximum quantity of juice, thus obtaining results which would, probably, have followed had Workman adopted similar tactics, but with the effect of losing more marks on "time" than he gained in "efficiency."

In what precedes, the "cart" of method has been "put before the horse" of description, and it is now time shortly to notice the mill and press whose performances have already been discussed. Bamber's mill consists of a pair of crushing rolls compounded of emery and cement, which ran, during the trial, at differential speeds of 160 and 260 revolutions respectively, while the feed roll made about 260 turns per minute. The latter consists of a single roller, about 3 in. in diameter, composed of a series of two-bladed brass knives spirally arranged on their axis, and almost exactly resembling the cutting apparatus of a domestic sausage-making machine.

The sample of pulp produced by Bamber's mill was excellent, and the pips were well crushed, but the feed of the machine was very imperfect. The mincing roller was so small that it would not take hold of the apples at all, unless these were

pressed upon it by the attendant, who was provided with a hand-tool for this special purpose. As a consequence, it was nearly as much as one man could do to get apples enough through the mill, although the rate of grinding was so slow (100 pounds per 5.22 minutes). On the other hand, the power absorbed was very small, but the machine was an amateurish affair, altogether inadequate to the wants either of farmer or cider merchant.

It must further be remarked that the mill with which Bamber competed at Glastonbury differed in certain important particulars from that which he entered for trial and showed at Plymouth; so that, had not the trials been deferred, he would have competed with a machine obviously less fitted for its work than that which he used at Glastonbury. In the Plymouth machine, motion was given by one crushing roll to the other through a pair of pulleys of $3\frac{1}{2}$ in. and $5\frac{1}{2}$ in. diameter respectively, coupled by a crossed gut belt, about $\frac{3}{8}$ in. diameter; whereas, in the Glastonbury mill, this arrangement had given way to toothed gearing, obviously because the gut had been found insufficient in actual work.

Bamber's press has been already so fully described in the Report on the Nottingham trials of Hay presses,¹ where it took a first prize, that there is no need here of many words. To the hay press there figured he has added a channelled bed, while he has furnished the platen with a number of strong spiral springs, which continue to exert a pressure upon the matter in the press after the attendant has loosed hold of the screw lever. In this way, it is claimed, expressing goes on continuously, instead of intermittently, as in the ordinary press; but it is doubtful whether in other presses the elasticity of the apple pulp does not itself ensure that continuity of pressure which the springs in question are designed to exert.

The quick return of the platen, which has already been alluded to, and which, indeed, makes the "piecemeal" system of pressing possible, will be found fully described and figured in the Report already quoted, and need not, therefore, be re-described; but it may be remarked, in passing away from Bamber's plant, that, slow as it was in action, and amateurish as was the mill in construction, its principles, new to the cider-making world, created great interest, and were not unfavourably discussed by the practical men present, who, it will easily be understood, were of a class and county not indisposed to "stand upon the old ways."

¹ See Journal, Vol. XXIV. (2nd Series), 1888, p. 587.

Table summing the General Results of the Trials.

	100 lb. of apples		
	Time occupied in grinding	Time occupied in pressing	Gallons of juice obtained
<i>Power Plant.</i>	minutes	minutes	gallons
Workman	1.3	2.17	6.0
Denning	1.4	6.1	5.9
<i>Hand Plant.</i>			
Workman	1.88	1.77	6.1
Bamber	5.22	12.33	6.9

The foregoing figures, measuring the performances of the various competitors, and hitherto scattered through this Report, may now be brought together, with advantage to the reader, since, apart from questions of good construction and workmanship in the various machines which, of course, received the careful consideration of the Judges, they point to the winner with no uncertain finger, and buttress conclusions which the Jury believe were equally shared between themselves and the public.

It is not often, indeed, that so interested and, therefore, interesting, a public gathers in a trial field. Every man on the ground seemed to know, as they say in Cornwall, all about "tin and fish," or, in Somersetshire equivalents, all about apples and cider;—what else, indeed, should one expect in Zummerzset, where a story of Mr. Neville Grenville's must illustrate how much these two things are to her children?

Not many years ago, some shallow muddy pools, hollowed in the Lias formation of the neighbourhood, formed the only water-supply of a certain Somersetshire village. These, in pre-scientific days, excited no man's fears, but housewives cooked and scrubbed in happy ignorance of the microbe and his wily ways. At length there came a new sanitary inspector, Pasteur-bitten, and a microscopist, who, shocked at the state of things he found, could not rest until he had brought down Mr. Bailey Denton to inspect and report. The authority arrived, and was duly horrified at the mud-holes whence, he presumed, the village drank. Turning to the hale old native who had shown him the way, he said, "And is *this* the water you drink, sir?" "Whaat did you zay, zur?" was the surprised reply, and the question had to be repeated more than once before the Western man could catch its drift. At length he "caught on," and, with a burst of hearty laughter, exclaimed, "Oh, Lard bless 'ee, noa, zur, we doant drink no watter down here, we've got plenty o' good zider in Zummerzset!"

And plenty of other good things and people have they too, says the Society's Reporter, bidding adieu to one of the kindest counties of England. In which spirit of sincere appreciation he further thanks the Steward and Engineer of the Society, not so much, on this occasion, for their assistance in lightening judicial labours, as for aid afforded in enjoying, under a most hospitable roof, two or three days of the pleasantest possible companionship.

DAN. PIDGEON.

THE FARM PRIZE COMPETITION OF 1890.

THE competition for prizes for the best farm management, which has now for twenty years been so useful and attractive a feature of the Royal Agricultural Society's annual gathering, was this year, by the liberality of the Plymouth Local Committee, thrown open to farms in the counties of Devon and Cornwall, a district in which there had not before been a competition of the kind in connection with the Royal meetings. The prizes offered were as follows:—

CLASS 1.—For the best managed ARABLE and GRASS FARM of 200 acres and upwards, of which not less than one-half shall be arable. First prize, 60*l.*; second, 40*l.* [A third prize of 20*l.* was subsequently awarded in this class on the recommendation of the Judges.]

CLASS 2.—For the best managed ARABLE and GRASS FARM above 100 acres and not exceeding 200 acres, of which not less than one half shall be arable. First prize, 60*l.*; second, 40*l.*

CLASS 3.—For the best managed ARABLE and GRASS FARM above 40 acres and not exceeding 100 acres. First prize, 50*l.*; second, 30*l.*; third, 20*l.*

The regulations of these competitions are now pretty generally understood; but it may possibly facilitate a comprehension of what follows, and at the same time be useful for purposes of record, to subjoin the conditions which had to be complied with:—

1.—The competition in all three classes is limited to Tenant Farmers paying a *bond-fide* rent for at least three-fourths of the land in their occupation.

2.—The Judges are instructed to take into consideration cases in which Competitors occupy land when Agents for their landlords, and are likely to derive undue advantage from that dual position.

3.—Competitors must enter for competition all the land in their occupation in the district.

4.—Competitors must have had the land in their occupation for not less than two years.

SCHEDULE OF FARMS ENTERED FOR COMPETITION.

No.	Name of Competitor	Address of Competitor	Name of Landlord	Extent of Farms—Acres			Soil	Subsoil	Tenancy	Remarks
				Arable	Pasture	Orchard				
Class I.										
1	Ford, J. Stranger	Hall Torra, Yealumpton, Plymouth	Mr. J. P. Bastard	154	107	—	Mostly light	Variable	Yearly	Commended
2	Franklin, Joseph Norris	The Bussels, Huxham, Exeter	Lord Poltimore	260	194	10	Light and heavy clay	Gravel, red sandstone & clay	21 years' lease	2nd prize
3	Hill, H. M. & Son	Newlake, Staverton, Totnes	Ecclesiastical Commissioners & others	221	107	33	Chiefly light	Mostly soft slate	Yearly	Extra 3rd prize
4	Lawry, William	Trevor, Gorran, St. Austell, Cornwall	Mr. Thomas Graham	252	37	—	Light and heavy	Kilns & clay	14 years' lease	Commended
5	Vosper, Wm. Peter	Marnfield, Plympton, Plymouth	Earl of Morley	436	385	—	Mostly light	Mostly slaty shales	14 or 21 years' lease from Ladyday 1889	1st prize
Class II.										
6	Bridgman, P. H.	Kington, Stoke Climsland, Callington.	The Duchy of Cornwall	81	75	—	Medium	Freestone & spar	Yearly	—
7	Cornish, Edward	East Farm, Chaceston, Kingsbridge	Lord Wm. Compton	141	40	—	Mostly light	Slate & clay	Yearly	1st prize
8	Creeber, John	Trevint, Menheniot, Liskeard	Mrs. Jane Seccombe	102	70	—	Light	Clay, slate and gravel	14 years' lease from September 1883	—
9	Ford, John S., jun.	Lusson, Holbeton, Ivybridge, Plymouth	Lord Revelstoke and Mr. H. B. Milham	145	27	—	Mostly heavy	Clay & rubble	Yearly, without agreement	2nd prize
10	Furneaux, Edwin	Poole Farm, E. Abington, Mount R.S.O., Kingsbridge	Mr. William Cubitt	83	43	—	Light	Slate & shillet	Yearly	—
11	Grigg, Samuel	Marraborough Farm, Hitt R.S.O., Saltash	Mr. Michael Loan	100	46	25	Heavy	Clay	14 years' term from Ladyday 1878	—
12	Horn, Charles	Blowiscombe, Yelverton R.S.O., Tavistock	Mr. Reginald B. E. Gill	78	77	—	Light	Slate & freestone	Yearly	Highly commended
13	Quarby, Henry	Mollard, South Molton	Sir N. W. Throckmorton, Bart.	97	70	—	Light	Slate, rock, & sandstone	Yearly	Commended
14	Smerdon, John	Cobberton, Dartington, Totnes	Trustees of late Mr. A. Champenowne	75	32	—	Light and heavy	Slate & clay	Lease 14 years from Ladyday 1883, determinable at end of first 7 years, by 13 months' notice	—
Class III.										
15	Bath, Charles	Gear Farm, Camborne	Mr. W. Cole, Pendurves	23	46	—	Light and heavy	Gravel, blue clay & marl	21 years' lease (in last 7 years)	2nd prize
16	Danvers, Ed. F.	Cotwell Farm, Egg Buckland, Crown Hill, Plymouth	Mr. C. Radcliffe	49	32	—	Light	Yellow sort of siliceous	Term for 14 years	3rd prize
17	Lawry, James W.	St. Mellon, Saltash	Earl of Mount Edgcombe and Colonel Coryton	60	94	30	Chiefly light	Very porous, slaty	Yearly	1st prize

[Continued from page 776.]

5.—The last day of entry is Saturday, December 7, 1889. The Entrance-fee is 1*l.* to Members of the Society, and 2*l.* to Non-Members. Members of County Agricultural Societies that are contributors to the funds of the Plymouth Local Committee will be allowed to enter on the same terms as Members of the Royal Agricultural Society.

6.—Competitors are recommended to send a tracing of the plan of their farms with their Certificate of Entry, and to have ready for the Judges on their first visit a correct list of the Stock on their farms.

7.—The Judges will be instructed to withhold the Prizes in the absence of sufficient merit in any of the competing farms.

8.—The Judges will be instructed especially to consider:—

1. General Management with a view to Profit.
2. Productiveness of Crops.
3. Quality and suitability of Live-Stock, especially that bred upon the farm.
4. Management of Grass-land.
5. State of Gates, Fences, Roads, and General Neatness.
6. Mode of book-keeping followed (if any).
7. Management of the Dairy and Dairy Produce, if Dairying is pursued.
8. The duration of the tenancy.

9.—The Judges are authorised to recommend to the Council the Award of Certificates to any really deserving persons employed on any of the competing farms for distinguished merit in the discharge of their duties, such recommendations to be accompanied by a certificate of good character and length of service from the competing Farmer.

Particulars of the farms entered for competition in each class are given in the Table on the preceding page, and the names of the Judges appointed by the Council to adjudicate on their respective merits are subjoined:—

JAMES A. CAIRD, Northbrook, Micheldever.

JOSEPH B. HILL, Smethwick Hall, Congleton.

FREDERICK PUNCHARD, Underley, Kirkby Lonsdale.

Nine of the farms are situate in South Devon, one in North Devon, and one on the eastern side of the county; the remaining six are in Cornwall. It was anticipated that as one of the counties, Devonshire, is the third largest in the kingdom, and the other, Cornwall, about the fourteenth, the two comprising together about 1,800,000 acres, the number of entries would have been much larger, especially in the Class for small farms, of which there are many in the two counties. But this anticipation was not realised, and even the very generous offer of Sir Massey Lopes, the chairman of the Local Committee, to double the amount of any prize won by any of his tenantry, failed altogether to meet with that response which so liberal and encouraging an advance deserved. Many reasons were urged for this paucity of entries. One, more flattering to the sensitiveness than to the enterprise of the local character, attributed it to the innate dislike of all Devonshire and Cornish men to defeat.

"A host of competitors might enter, but only as many could win prizes as there were prizes to be competed for, whilst the unsuccessful ones would be impatient of defeat!"

Another cause (and one which probably had a practical and deterrent effect) was the condition that "one half the farm must be arable," and a doubt as to what the word "arable" here included. Throughout the two counties there is a large extent of land which has of late been either laid down to permanent grass, or which, originally laid down for a rotation, has gone to grass so well that it has been allowed to remain "green side up." In some of these cases the landlords or previous occupiers had provided the seeds, but in others the present tenants had done so. In the former, the land had, of course, passed from the category of arable to that of pasture; but in the latter the tenant might claim the right to plough up the land at will, and so be entitled to class it as "arable." Be this as it may, the fact remains that some of the most fertile districts, notably that of Tavistock and Milton Abbot, where it is claimed lies some of the best grazing land in the kingdom, were unrepresented. So equal, also, are the proportions of pasture and arable upon many farms, that the inclusion of orchards amongst the former turned the scale against their occupiers' right to enter.

But limited as the competition undoubtedly was, it was not without its special features of interest, because of the diverse circumstances of situation, and the various methods adopted by the competitors to develop the capabilities of their several farms. Some had all the advantages of situation which proximity to a large town or seaside resort could confer, whilst others laboured under the disadvantage of being distant ten or twelve miles from the nearest market or railway station. Again, some farms had inherent capabilities for the production of certain special crops, such as apples for cider, strawberries and other fruit for early and distant markets, green forage crops for sale in adjacent towns, and so on; and all these capabilities were being turned to the most profitable account. Further, there was the large capitalist spending his money freely, but judiciously, in the cultivation and manuring of his land—putting plenty in and getting plenty out—whilst the farmer of moderate means, living comfortably, but not extravagantly, was devoting all his energies in efforts to make his farm pay, despite the times or the lack of special advantages of either soil or situation. Finally, there was the working man, plodding successfully against the difficulties attaching to all small agricultural holdings, and eking out the profits from his land by extraneous carting, or other work obtainable in the district.

Following the usual practice of these inspections, the Judges paid their first visit to each of the competing farms in January last, when they saw the bulk of the root crops of the previous year, examined the stubbles and stacks of corn and hay, and inquired into the winter management of the stock. They also inspected most of the fields, critically examined the sheep and other stock, and had peeps into the account books and other records. As a result of this, the competition in Class II. became slightly reduced, because of the manifest superiority of the management of more of the competitors than there were prizes to award. The farms which were left in this Class, and all the original entries in Classes I. and III., were visited a second time in June, when the various stocks and crops were carefully inspected, and all the details of management fully inquired into. At the conclusion the Judges compared notes, and found that they had individually arrived at decisions which were practically unanimous.

CLASS I.—FIRST PRIZE FARM.

Occupied by Mr. W. P. Vosper, Merafield, Plympton, Plymouth.

This is the largest farm in the competition, and, as the Judges soon found, is in the hands of a man of unusual enterprise, skill, and capital. Situate as it is between four and five miles from the three self-adjacent towns of Plymouth, Stonehouse, and Devonport, its management is mainly directed to reaping all the advantages which such a situation confers. In this direction few, if any, men can have accomplished more than Mr. Vosper has done, and rare indeed are the farms in the kingdom which can show higher or more satisfactory results.

The farm comprises 821 acres, of which 436 are arable, and the remainder pasture and orchard. It was formerly let in four separate holdings, one of which (Saltram) was the home farm and park of Saltram House (the residence of the landlord, the Earl of Morley). This portion was taken by Mr. Vosper in 1868 in succession to his father, and was the starting point of that extensive trading with the "Three Towns," which he has subsequently so profitably developed. Four years later Wixenford was added; and in 1885 Merafield, which Mr. Vosper had been managing for some time for his mother, was taken on his own account. Lastly, Hardwicke was added in 1887, and marvellous and rapid has been the change in its productive capacity. The four farms are now held as one under a lease for 14 or 21 years, at the option of the tenant, from Lady-day, 1889, at a rent of close upon 2% per acre,

In 1885 the landlord erected a handsome and commodious house and outbuildings, also sundry sheds and farmbuildings. The tenant at the same time built a laundry and greenhouse, and made other improvements at a cost of about 1,100*l.*, and for these and certain drainage, compensation is provided at the end of the tenancy. The farm buildings are, from the circumstances of their history, placed at four different points of the farm, but are none the less convenient for the profitable working of the land. They are fitted with various convenient appliances, some of which are Mr. Vosper's own designs, for economising labour, notably (1) a chaff elevator at Hardwicke, with shoots for delivery in three directions; (2) a Dutch barn at Merafield with corrugated iron roof, of which the centre sheet lifts up to allow hay, &c., to be passed through from the elevator; (3) a cement trough arranged specially for washing roots and potatoes when required, but at other times forming a large drinking trough; (4) a broad step ladder from the centre of the feeding passage of the cowshed, by which ready access can be had to the granary and fodder store above, but which can be lifted out of headway when the feeding passage is required for other purposes. These and many other somewhat similar items are all proofs of a master mind bent upon accomplishing his tasks at as small an expenditure of labour as possible.

Arable Land.

The cropping in 1890 is as follows, viz.: wheat, 69 acres; barley, 56; oats, 11; potatoes, 14; vetches, 7; swedes and turnips, 37; mangel, 38; cabbage, 9; clover, &c., cut for hay, 52; rotation grasses grazed, 143 acres: total, 436 acres.

The rotation followed, with the one exception referred to further on, is (1) mangel, (2) wheat followed by trifolium, (3) roots, (4) barley or oats, (5) seeds which remain down three or more years according to circumstances. The mangel get a heavy dressing of dung (30 to 40 loads per acre of home-made, or 40 to 50 loads of town dung or scavengings from Plymouth), and in addition 3 cwt. each of mangel manure, bone meal, and dissolved bones drilled at the same time as the seed. Of the latter 9 lb. per acre is sown, and as early in April as the land can be got ready. In the autumn, before any frost may be expected, the roots are pulled up and carted to the yards or store sheds near the buildings and consumed there, the practice in Devonshire being to commence giving mangel much earlier than is usual elsewhere—say about Christmas. Some are retained for the ewes and lambs in the following spring, and so plentiful had

been the crop of 1889 that on the Judges' visit in June there were several cartloads unconsumed.

Several varieties of wheat are grown. One field of Scholey's Squarehead was a most promising one, and on the 9th June was just coming into ear; another of Oakshott's Champion, and others of Hardcastle and Carter's Red are described in the Judges' books as grand crops, and the best seen on the tour. Mr. Vosper says his crops frequently produce 50 bushels of wheat per acre, and on one occasion he got 80 bushels per acre of Normandy White. In 1888 he sold the straw from 12 acres for 84*l*.

As soon as the wheat crop is removed, the land is scarified, dunged, and cleaned (if necessary), and a crop of trifolium sown, which in the following spring is sold green at Plymouth. This crop is one of the most remunerative grown, because of the favourable market for its disposal. The land being in high condition already, and specially dunged on the wheat stubble, the trifolium grows rapidly, and is ready for sale before most other crops in the neighbourhood. Thus Mr. Vosper is able to get the higher price of the early market, so that his return for this crop not unfrequently realises 10*l*. per acre. Indeed, the total receipts for green forage (inclusive of occasional cuttings of clover) not unfrequently reach 500*l*. in the season. So much of the trifolium as is not sold before the prices get down to a low level is made into silage in a stack pressed with Johnson's apparatus. Part of the stack made from the 1889 crop was standing in the yard in January, whilst in June the surplus of the 1890 crop had been so secured. An occasional second mowing of clover is also made into silage, when not sold green in the Three Towns.

As the crop of trifolium is removed day by day the plough follows immediately to prevent the stems getting dry and hard, and afterwards the land is prepared for swedes and cabbages. For the former about 25 to 30 carts of dung, and 3 cwt. each of superphosphate (mineral) and dissolved bones, 4 cwt. of nitrate of soda, and 5 cwt. of salt are used. The cabbage plants—mainly Drumheads, here called "Flat-polls"—are generally put in on the flat during the first week in June, at about 2 feet 2 inches apart each way. The crop is given to the dairy cows throughout the winter. The swede crops are not sown until about midsummer, and the common turnips later still. In the autumn some of the tops of the swedes are sold green as a vegetable, and make from 20*s*. to 30*s*. per acre. The roots are mainly fed off by sheep, which get an allowance of cake and corn. The barley crop follows, and Mr. Vosper,

being a maltster amongst various other vocations, is able to make the best of his own growth. The sort chiefly grown is Golden Melon, though this year some fields have been planted with Chevalier and Beardless. Lime is commonly applied for this crop.

A mixture of clover and other seeds is sown with the barley, the sorts and quantities varying according to the soil, and the period for which the lea is intended to remain. For a three or more years' lea the following is commonly sown:—Alsike clover, 2 lb.; Somerset clover, 6 lb.; Dutch clover, 1 lb.; Cornish marl, 2 to 3 lb.; trefoil, 1 lb.; cocksfoot, 5 lb.; timothy, 4 lb.; foxtail, 3 lb.; rye-grass (Devon eaver), 2 gallons. In this mixture the Devon eaver has of late been reduced from 4 to 3 gallons, and now to 2. If the crop of grass is intended to be "bundled" and sold green, a larger quantity of timothy is added, because of the partiality of the Plymouth buyers for that variety. Mr. Vosper, being *inter alia* a seedsman, is very careful in the purchase and selection of his seeds, and applies his knowledge of the various grasses to so good a purpose that his crops of seedgrass are free from imported rubbish, and have the proportions of each variety regulated according to the soil and other circumstances.

The first "seeds" are generally mown and made into hay. Two fields were being mown at the time of the Judges' second visit, and most heavy and abundant crops they were. These were afterwards secured in first-rate condition, and placed in a stack which was estimated to contain 100 tons. Occasionally, the third year's lea is mown—especially if the grazing land is full of grass. In this event another dressing of dung is applied. Sometimes a crop is mown early for green fodder, and in such cases a second mowing is taken in the same season. Leas in their last year get a dose of nitrate of soda, and are cut before breaking. Lime, of which a considerable quantity is used as a corrective of the heavy manuring rather than on account of its scarcity in the soil, is then applied, and the land is carefully skirted for the succeeding root crop.

Some of the pastures get an occasional manuring of either dung, or bones, or artificials. Indeed, the whole of the grass land on the Hardwicke portion has been dressed with bones (raw or dissolved) during the two years it has formed a part of this farm, and a very marked contrast is visible in its productive powers when a glance is taken at adjoining fields or surrounding farms.

It will thus be seen that Mr. Vosper is a "heavy tiller." His bills for artificial manures in the last two years amounted to

close upon 1,000*l.*, whilst the stable manure from Plymouth cost him about 600*l.*, in addition to some 300*l.* worth of town scavengings. When to this is added the residue from an outlay of 4,500*l.* in cake and other feeding stuffs, it will be readily admitted that he puts "plenty into the land." One consideration, therefore, which the Judges had to take into account was whether he got "plenty out" in return, especially as the chief of their instructions was to take "profit" into account in deciding upon the different methods of management. An inspection of his books, and a careful consideration of the crops grown, and prices obtained, left no doubt upon their minds that the return in this case warranted the outlay.

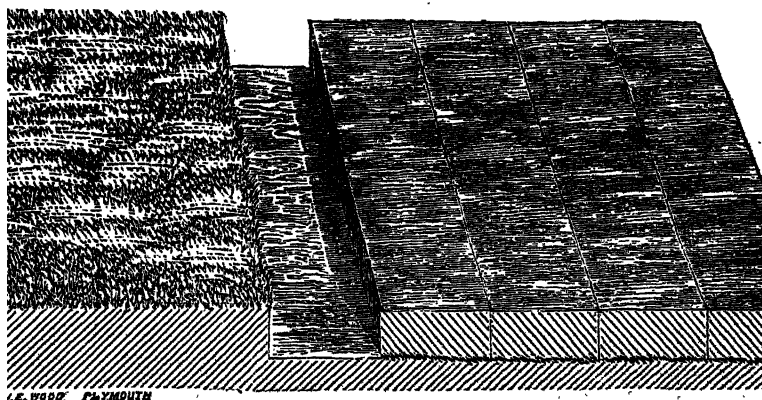
Such is the ordinary course of treatment and cropping of the great bulk of the arable land of the farm. But a somewhat different method is followed in the case of one field (Chelson Meadows), which, being low-lying and a strong alluvial deposit on stiff clay, requires special and exceptional treatment. This field forms part of a tract of about 200 acres which, lying below high-water mark and covered by high tides, was reclaimed about eighty years ago at the expense of a predecessor of the present Earl of Morley, by an embankment of about 2,000 yards long, and has since been drained and brought into cultivation. Part of the land is in Mr. Vosper's occupation—other parts, chiefly in grass, are laid to adjoining farms, and are used as the race course for the Plymouth meetings. The particular field specially referred to has been cropped as follows, viz.: 1884, mangel; 1885, wheat; 1886, mangel (heavily dunged); 1887, wheat (limed eight tons to the acre); 1888, clover (cut twice, bundled, and sold green); 1889, the same (gas lime, six to seven tons put on fresh); and 1890, mangel.

In January last this field was being ploughed by one of Davey, Sleep, & Co.'s balance ploughs, which laid the furrow slice seven inches deep perfectly flat (fig. 1). The land was then left untouched until the end of April, when it was cultivated or "tormented" two or three times, then manured with Plymouth scavengings at the rate of ninety-seven cart loads to the acre, and afterwards ploughed over very shallow—say two inches deep. This was followed by various rollings, harrowings, and pressings (with Cambridge presser), until reduced sufficiently fine to be fit for drilling. As this land can only be worked when dry, Mr. Vosper, when he finds it favourable, sends as many of his men and horses there as can well be spared. As many as twenty-two horses have been working in one field—small as the largest on the farm may be—at the same time, and it is a common saying amongst the neighbours that "Vosper

never turns into a field in the morning but he is sure to finish it before night."

At the time of the writer's intermediate visit in May, eleven horses and eight men were engaged here in the various operations, from the first cultivation, after flat ploughing down, to drilling, and the final rolling and harrowing. At this time, Mr. Vosper was somewhat anxious about making the best use

Fig. 1.



of the short spell of favourable weather experienced this year, and succeeded in doing so. On the Judges' last inspection in June, the plants were well up, had been horse-hoed, and were being hand-hoed and singled. The crop of mangel on this field has reached 70 tons per acre, and wheat over 60 bushels per acre.

Live Stock.—The numbers seen on the two visits were as follows:—

	First visit	Second visit
Cows in milk	134	125
Cows and heifers in calf or barren	55	21
" " feeding	15	61
Steers feeding	7	10
" stores and yearlings	13	15
Calves	15	8
Bulls	4	4
	243	241
Breeding ewes	251	200
Lambs	97	267
Wether hoggets	176	80
Ewe "	177	173
Ram "	28	25
Aged rams	4	4
Two year wethers feeding	62	—
Geld ewes "	24	41
	819	760

Brought forward	1062	1034
Work horses	22	24
Hacks	2	2
Colts and yearlings	5	4
Ponies	2	2
	31	82
Pigs	72	114
	1,165	1,180

This gives the large proportions per 100 acres of 29·60 cattle, and 99·75 sheep, the average of the county being 20·47 cattle and 69·74 sheep. Between the visits the following sales had taken place, viz.: 192 sheep, 25 calves, 18 cows, 7 steers, 33 pigs, and 36 lambs; whilst the purchases had been 2 steers; 23 cows, 5 heifers, 1 calf, and 2 horses. One horse had died, and 6 pigs had been killed for the house.

Periodical sales are held on the farm, when much fat and surplus stock is sold, whilst on the other hand the cattle bought annually cost about 2,500*l*.

The dairy cows are kept for the production of milk and cream for sale in the Three Towns. The returns from this source are simply enormous, and amounted in the last two years to close upon 10,000*l*. This is something like 30*l*. per cow per annum. Some idea of the extent to which these returns are in excess of those from ordinary dairy farms may be formed when it is mentioned that, in the eastern part of the county, a common practice prevails for farmers to sublet their cows to dairymen for from 10*l*. to 12*l*. per cow per annum—the farmer providing cows and a certain acreage (generally 50 acres for 20 cows) to run them on, including a field or two for hay, also buildings and dairy; whilst the dairyman finds only extraneous feeding stuffs, if any are used, and labour for attending and milking the cows, and for conveying the produce to market. Mr. Vosper's large return arises mainly from his cows being extra heavy milkers, and from the high price obtained for his cream, which is thicker, on account of the cows being unusually well fed and attended to.

The milk cows are kept at Saltram and Merafield, and get daily throughout the year a liberal allowance of artificial feeding stuffs. In winter, in addition to cabbages, mangel, silage, and hay, a mixture of hay chaff, maize meal, ground cotton seed or linseed cake, bran, malt coombs, and fenugreek is given to the extent of about 12 lb. per head per day. In summer, about half that weight is given. The cows run out all the year round except in the very rough part of winter. One peculiarity of Mr. Vosper's stocking is to put large numbers—say 50 or 60

cows, in like condition as regards breeding—into a field at the same time, and change the fields often, rather than divide the cows into smaller lots, and spread them over more fields. He considers the freshening of the grass under his plan very desirable. The dry cows are kept at the other farmstead, and are either fed for the butcher or retained for breeding, according to their state and milking capacity—the rule being that, as soon as a cow goes wrong in respect to breeding or milking, she is fed off as rapidly as possible.

The supply of cows for the dairy is kept up by frequent purchases of newly calved ones. Mr. Vosper, being well known in the neighbourhood as ready at all times to purchase good milkers at top market prices, gets early intimation of any that are for sale, and when the appearance of an animal suits him he does not often miss the opportunity of buying. From 15 to 20 calves are reared yearly, and these are only from the very best milkers; the remainder are sold off, so as not to entrench upon the supply of milk available for sale.

For a herd mostly made up of individual purchases this one bears a remarkably uniform character, all the animals having the appearance of having been cast in the same perfect mould. The Judges on their first step on to the farm were greeted by as fine a lot of 70 dairy cows as they would wish to see, all with large level frames, deep sides, and capacious udders, which went far to remove from their minds impressions which had previously been formed somewhat adverse to the South Hams cattle. No one who has seen Mr. Vosper's herd can venture again to express a prejudice against the breed in its native district.

Only the morning's milk is sold as new, circumstances not being convenient for an evening delivery into the towns. Milking commences between 4 and 5 A.M., and is conducted by 13 or 14 hands, to each of whom 10 cows are allotted. In warm weather the milk is passed over a refrigerator prior to its being put into tin cans and sent off, which has to be done in time for delivery at Plymouth at 7 A.M. As an instance of Mr. Vosper's energetic activity it should be mentioned that he is frequently at the Saltram Buildings when operations begin in the early morning. The evening's milk is set in tin pans holding about 2 gallons apiece. These tins are all of a uniform size, so as to allow of each one being placed on any of the 4 holes prepared in a stove on which the scalding is done. This work takes place on the following morning, and is superintended by the foreman's wife, who has done the dairy work for Mr. Vosper and his father for nearly 30 years. Of her and her work Mr. Vosper

says he cannot speak too highly, and certainly the Judges noticed about the dairy, premises, and utensils under her charge a degree of cleanliness which confirms his opinion of her industry, and his reliance on her work being always thoroughly and properly done. The cream is taken off the milk on the following morning, and placed in glass dishes sent by the various purchasers so as to be fit to go on to the table at once. These go with the morning's milk to Plymouth, or to houses in the immediate neighbourhood, as the case may be.

Very little butter is made, and only when the supply of cream is in excess of the demand. If the prices are low, this butter is put into pans, salted, and preserved until a higher price can be secured. So much of the scalded milk as there is demand for goes to Plymouth with the morning's milk, and the remainder is given to the few calves or many pigs which are reared and fed. The delivery of milk is done by two men, each of whom carries with him a book in which are set down details of the quantities received and delivered. This book is taken daily to Mrs. Vosper, who enters the several transactions in one larger book prepared for the purpose. Often 80 to 100 items a day have to be entered in the general ledger. Thus the dairy and its produce is a very important element in the management of this farm, and here, as in other departments, Mr. Vosper has the advantage of a most efficient helpmate in Mrs. Vosper.

A breeding flock of 250 South Hams ewes is kept, and their produce reared to maturity. Some of the earliest lambs go off fat. Great care is taken in selecting a few of the best of the ewe hogs to add to the flock, and so keep up that high character which it has long possessed. Mr. Vosper being a frequent judge of this breed of sheep, knows the best type to aim at, and has succeeded in raising a flock of undoubted excellence. Some of the wether hogs were estimated to weigh 28 to 30 lb. per quarter and to be worth at butcher's price 4*l.* apiece.

Like most of the other Devonshire farmers Mr. Vosper is not horse-proud, though his stud is of that useful and light active character which is so suited to the district. Three are Suffolks which seem quite at home here, and two others were purchased in Wales. They are all well fed and attended to, and, in particular, each one gets an occasional bran mash, or drink of linseed gruel, and a tablespoonful of nitre every Saturday night, as a corrective of their high feeding during the rest of the week, which consists mainly of hay, chaff, beans, malt, bran, and crushed oats. All are clipped twice yearly. Pigs are not here that insignificant item which is usual in the locality. Twenty-one breeding sows are kept and their produce fed off.

A large lot of poultry is kept and reared for table, the proceeds in this department being 190*l.* per annum.

The orchards are well attended to, and special attention is paid to top dressing and pruning.

The fences and gates on the farm are models of neatness, for Mr. Vosper neglects nothing. In the fields where the cows run, a row of barbed wire is placed on short stakes driven horizontally into the bank, to prevent the animals damaging the fence. Every fence on the farm is "dressed" once a year, and no scrub is allowed to grow on the top.

The labour bill on such a farm is of necessity a heavy one, amounting as it does to about 1,300*l.*, or 1*l.* 10*s.* per acre per annum. The regular staff numbers 30 hands, who receive from 13*s.* to 16*s.* per week, with sundry privileges.

Mr. Vosper seems to have imparted to his men much of that smartness and energetic activity which is so strong a feature in his own character. The Judges saw none of that slouching, or deliberation of movement, in his workmen which is so common in the agricultural labourer, and so trying to the patience of an active mind. A most pleasant feeling exists between both parties, for each appreciates the good qualities of the other, and one result of this happy state of things was seen when, during the recent labour agitation in the neighbourhood, nothing occurred to disturb the relationship between master and man on this farm. Mr. Vosper speaks in high terms of most of his men, especially of some half-dozen who have worked for him and his father for periods varying from 19 to 24 years, and whom he has recommended for the Society's Certificates of Merit.

The Plymouth trade in milk, poultry, and green food (for which the annual tollgates paid amount to upwards of 80*l.*), necessitates a somewhat elaborate system of bookkeeping, the bulk of which falls to the share of Mrs. Vosper, who in this as in many other ways is a true Devonshire farmer's wife, and ever ready to take an active and efficient part in the work. The books are prepared specially for the farm, and show the receipts and expenditure under each of the several headings.

A balance-sheet is annually drawn out, those for the last two years showing an investment of capital amounting to between 15,000*l.* and 16,000*l.*, whilst the annual turn-over amounts to from 13,000*l.* to 14,000*l.* The figures read more like a large trading concern than a mere agricultural occupation.

Mr. Vosper is upon the best of terms with his landlord, the Earl of Morley, as indeed who could fail to be with so genial and thorough a nobleman in every sense of the word? The agent, Mr. Newbury, also speaks highly of his tenant's qualifications.

The man who has much to do can always have more, and not unfrequently does more, and does it better, than he who has little to do. This is the case with Mr. Vosper, who not only takes his daily part in the supervision and management of this farm, and the malting, and seed business referred to, but is a director of various other concerns, and in particular of the Western Counties Agricultural Co-operative Association, which has an annual turn-over of 140,000*l.* in feeding stuffs, manures, seeds, and implements sold to agriculturists of the district, of whom some few of the present competitors form part. Mr. Vosper, further, is a member of the County Council, besides acting privately as trustee for various friends and relatives.

CLASS I.—SECOND PRIZE FARM.

Occupied by Mr. J. N. Franklin, The Bussels, Huzham, Exeter.

This farm comprises 454 acres, of which 250 are arable, 194 pasture, and 10 orchards, and is the property of Lord Poltmore, whose residence (Poltmore House) and park are in close proximity to one end of it. The land lies in two divisions, separated about one mile from each other; one (Poltmore Farm) is four miles, and the other (Bussels), where Mr. Franklin resides, is six miles from Exeter, in the eastern division of the county. Mr. Franklin holds under a lease for 21 years expiring in 1901, and has been tenant for 20 years, having followed his uncle, who had occupied the farm for 30 years.

About 80 acres are low-lying water meadows of which the soil is stiff clay, but which under present management is made very productive. Much attention has been given to the drainage of this land, and to the provision of the necessary gutters and carriers for its irrigation. One portion was drained 15 years ago at Mr. Franklin's sole cost, but of late the landlord has provided the tiles, whilst the tenant has carted and put them in. The main drains are generally 5 to 6 feet deep, with minors running into them at various depths and distances.

One long main drain of 400 yards deserves especial mention because of the difficulty of its construction, and the great apparent benefit which has resulted. Owing to the very slight fall the work had to be most carefully manipulated, and naturally received Mr. Franklin's close personal attention. The drain, varying in depth, is carried straight from point to point with as slight a fall as practicable, and at each angle, or change of direction, there is an inspection and flushing chamber, 2 feet 6 inches in diameter, with a wooden lid, which is mainly kept locked to prevent obstruc-

tions being thrown in, and getting thence to the drain. Upon the Judges' first inspection the water level in the surrounding land was, owing to a previous heavy rainfall, considerably above the pipes, but in June it had lowered to about half the bore of the pipes, thus showing that the drain is acting in a most satisfactory manner. The work cost Mr. Franklin about 300*l.*, and reflects very great credit upon his engineering skill. It has resulted in a marvellous improvement, by converting 35 acres of waterlogged land into excellent and safe grazing ground.

The meadows are irrigated at intervals between November and April, and occasionally get flooded in other wet seasons. To regulate the flow and distribution of the water, sundry gutters and carriers have been made, and some floodgates fixed. The very efficient working order in which these are kept is only one amongst many instances of the close care and attention which Mr. Franklin devotes to all parts of his holding. The bed of the river (the Clist) is cleared every second year, and the distributing gutters yearly, or as they require it.

Thirty-six acres of these meadows are mown annually, and, judging from the nature of the herbage, the process has led to improvement. The rest are grazed, and in summer time carry one bullock to the acre. The stock is changed from one field to another every few days, and towards autumn the more forward animals are picked out, and put on the best of the land, getting if needed a little cake, though this is seldom the case. The other animals, being fresh in condition, are rapidly finished off in the yards and buildings. In the spring, the early keep in these meadows is invaluable for ewes and lambs, which run on during the day, but are removed to higher and drier ground at night. The ewes are put on the grass a week before they are due to lamb, so as to flush their milk.

Adjoining the meadows is a dry old pasture, which in January was getting a dressing of Exeter dung, and in June was full of the richest and most succulent herbage, proving that the manuring was not a casual or special one. Round about the Bussels House and homestead some 33 acres have recently been laid down to permanent pasture at the tenant's expense, and are doing remarkably well. The fields are very clean and the grasses true to sorts.

On the arable land, the four-course system of cropping is followed, except upon one portion where barley is found to succeed best when in immediate succession to some other corn crop. Last year the corn grown here went to a maltster at 35*s.* per quarter, and this year barley is following barley with prospects of an excellent result. About seventy acres of wheat are

grown annually, partly after lea, and partly after roots. Some of the fields seem light for this cereal, but under present management the crops seem to warrant its growth. Mr. Franklin finds that upon the average of the last seven years his wheat has thrashed out at the rate of 34 bushels per acre. The wheat sold in 1888 realised 455*l.* 10*s.*, and in 1889 467*l.* 15*s.* 6*d.*; barley in the same years producing 504*l.* 16*s.* and 377*l.* 12*s.* respectively. Essex Rough Chaff or Long Buff is the sort of wheat mostly grown, and is drilled at the rate of two bushels per acre in rows 9 inches apart to admit of horse-hoeing, a process which is not commonly applied to corn crops in the county, but which is deemed necessary here to keep down the poppies to which the land is much subject. With the exception of this weed the land generally was clean.

About one third of the root crop is mangel, another third swedes, and the remainder common turnips, rape, cabbages, and thousand-headed kale. One field of 16 acres for mangel had been steam-cultivated in the autumn, and in January was having a dressing of farmyard manure, of about 20 loads to the acre, which was being ploughed in. The seed was drilled on the flat early in May at the rate of 5 to 6 lb. per acre, in rows 2 feet apart. In June the plants were well up, and had been horse-hoed twice, the hoe being of a kind commonly used in the district, and which does two whole and two half-rows at a time.

Little or no artificial manure is used, as Mr. Franklin does not care about it, especially as he is able to get from Exeter what extra dung he requires. In 1888-9 one hundred and nine waggon loads, of three tons each, of this dung were purchased, and in 1889-90 one hundred and sixty-three, the increase being due to the Tramway Co. (from which it is bought) having increased the number of their horses. Part of this year's purchase had been put on to a field of first year's seeds, which was an unusually forward and heavy crop. The mixture for this lea (intended to be down for 2 years) was Italian ryegrass, 1½ pecks; red clover, 8 lb.; alsike, 2 lb.

Cabbages and kale are grown, but only sufficient potatoes to supply the house. The cabbage and kale plants are placed during the last ploughing on the face of every second furrow slice as soon as it is turned by the double furrow plough, which on the next journey covers their roots, and leaves a bed for the following row of plants. To secure firmness a stone roller is sent across the rows. The fine crop of cabbages planted in this way in 1889, which the Judges saw, prevents them expressing any adverse opinion upon this method of planting, which has at any rate one merit, *i.e.*, simplicity. Trifolium and

winter vetches are also grown. A portion of the former crop was in June being made into silage in a stack in the field where it had grown. The only weight intended to be applied was the placing of new hay on the top of the stack about two or three days afterwards.

The fields are much larger than common in this county of small inclosures, and are mostly from 15 to 20 acres each. Considerable lengths of old fences and banks have been removed in bygone years, and much land has thereby been added to the crop-growing area. Two lengths of thorn hedges have been planted by the present tenant, one 12 years and the other 5 years ago, and both prove that thorns will grow well in the district on clay land, though Mr. Franklin doubts their doing so on light land. One of these lengths is about 800 yards, and was in substitution for a bank which was 10 feet wide throughout. The saving of land in this case is put at an acre. The thorns were planted on the flat in a single row, and received a little dung at planting time. They have since been carefully attended to, as indeed have all the fences on the farm. At the foot of the old banks in fields where cattle are grazed, a row of barbed wire on upright posts has been placed to prevent bullocks from crumbling the banks down with their horns, stones for facing being very scarce and expensive in the district.

Four teams of horses are kept, with one extra horse for the shepherd, and another for odd work. Two brood mares and their colts, and two pony mares and their produce complete the horse stock, except two hacks, one of which is kept for Mrs. Franklin's use, and the other to take Mr. Franklin on his daily rounds. One of the ponies (an Exmoor) might, if shown at Plymouth, have saved the class from some rather uncomplimentary remarks which have been passed upon it.

Only sufficient cows are kept to supply the house. From 80 to 90 two-year-old steers or heifers are bought annually, and grazed or fed off. About 50 of them are grazed on the water meadows and adjoining old pastures, and the remainder are stall-fed in the winter. Some are North Devons, others South Hammers, whilst a few are cross breds. Most of them are bought in Exeter market, one of the chief centres for agricultural produce of all kinds. Mr. Franklin being a regular attendant there, and a good judge, as also known to be at all times open to buy, is frequently offered small lots of animals suitable for his purpose. His keen and thorough judgment enables him to make his purchases judiciously, and to select only such animals as are likely to do well and pay, which, under the prevalence of auction marts, is rapidly becoming a lost art. The 31 steers

and 23 heifers seen by the Judges in June had been bought at various times within the year in 22 different lots at an average of 14*l.*, and had been remarkably well purchased. Between the two visits of the Judges 1,650*l.* worth of stock had been sold off, and 750*l.* bought on in their places, and yet the valuation of stock at Lady-day 1890 worked out at practically the same figures as in the previous year's balance-sheets, thus showing that the transaction had not been a casual one.

During the summer the cattle need little or no cake, but those tied up in the winter get 5 lb. daily, with maize and other meal. It may here be incidentally mentioned that, as soon as any fresh cattle are brought on to the farm, they are dressed with brine for the prevention of warble fly.

A breeding flock of 180 ewes of the Devon long-wool breed is kept, and a right good grand lot they are. A few are remnants of a pure bred flock which Mr. Franklin formerly had, and with which he was at one time a most successful exhibitor in the show yards of the "Royal," Bath and West of England, Royal Counties, Devon County, and numerous other societies, also at Exeter and other fat stock shows. He won between 70 and 80 prizes in the 10 years prior to 1886. In this latter year he was unfortunately seized by a constitutional infirmity which has since become more or less acute and permanent, and has prevented him from devoting that close personal attention to his flock which is necessary to procure success in the showyard. He has therefore been compelled reluctantly to abandon breeding for purity and exhibition, and has turned his attention to rearing half-bred lambs for early feeding.

His ewes are now crossed by a Hampshire Down ram, and the produce, which generally begin to arrive about the middle of January, are sold off fat between the following November and February. In January last some were being sold at 3 guineas apiece. Early in the year between 200 and 300 long-wool hoggets are bought. Of these 50 of the best are retained for the flock, the remainder being put at once on turnips and fed off. Some go before shearing time, others after. The draft and geld ewes also go off fat. Thus between 1st April, 1889, and 1st April, 1890, no less than 564 sheep were sold off. At the time of the June visit there were on the farm 127 ewes for flock, 44 draft ewes, 34 ewe hoggs for flock, 72 wether hoggs, and 216 lambs. All, including the lambs, had been shorn. The ewes and wethers were estimated to have clipped 12 to 14 lb. of wool each in the grease, and the lambs about 3½ lb. each. The present price for this wool is 8*d.* per lb. The lambs had been weaned since 1st May, and 110 of the earliest, which after their

shearing looked more like wethers than lambs, were folded on winter vetches, and getting mangel (of which sufficient were in hand to last a month), and $\frac{1}{4}$ lb. of cake, and $\frac{1}{4}$ lb. maize each per day. The vetches were mown daily, and put between two narrow rows of hurdles, on either side of which the lambs were penned. Mr. Franklin prefers forcing his lambs rapidly, towards the last six weeks of their stay on the farm, rather than commencing at once on their arrival.

Much care is devoted to the manufacture and "matching" of cider, of which about 200 hogsheads are produced yearly. Before pounding, the apples are sorted so that only those of equal ripeness are ground together. The cider is carefully racked and matched, and examined daily during the process of fermentation. An excellent quality of sweet cider is thus secured, which is sold to agents who supply the London and other markets. Every attention is paid to cleansing the casks or hogsheads, and for this purpose a mechanical appliance is used which greatly facilitates the work. Mr. Franklin finds that, like all other home producers, cider makers are affected by foreign competition, especially from America, whence cider is sent at low freights as ballast in the large steamers, and comes into this country duty free.

The labour bill amounts to about 500*l.* a year, and includes the wages of a bailiff, whose services have become necessary since Mr. Franklin's infirmity. The labourers get 11*s.* to 13*s.* per week, and 3 pints of cider daily. Nine of them live in cottages on the farm. In harvest time the cutting, binding, and setting up of the corn is let at 4*s.* per acre; machine and horses lent free. The stacking is done by day work. Three of the labourers are recommended by Mr. Franklin for long and faithful service. One of them (the shepherd) was bound as a parish apprentice to Mr. Franklin's grandfather, and has since been on the farm or with the family for 55 years. Mr. Franklin speaks in high terms of all three.

A day-book and ledger is kept, as also is a detailed cash-book, in which the cash transactions are entered under the several headings, so that the total receipts for cattle, sheep, or corn, or cider, and so on for each year, are shown, as also the payments for labour, stock bought, feeding stuffs, &c., purchased. A record is also entered of the cost price of each lot of animals purchased, and the money received upon their sales, so that at a glance the money left by each lot can be ascertained. Mr. Franklin's experience coincides with that of most stock farmers, namely, that the year 1889 was the best there has been for graziers and feeders for many years.

Mr. Franklin ranks deservedly high in the respect and good opinion of his brother farmers, by whom his business and other capacities, and kindliness of disposition, have frequently been recognised in most flattering ways. For many years he has acted as Vice-chairman of the Local Highway Board, and has taken an active part in the superintendence of the road repairs. At the first County Council election he was returned by the largest majority of any of the members. In 1884, a gold watch was presented to him by his political and other friends, in lieu of one of which he had been relieved when leaving a political platform. In the present competition he has run his successful competitor very close, and is thoroughly entitled to the honours awarded him.

CLASS I.—THIRD PRIZE FARM.

Occupied by Mrs. Hill and Son, Newtake Farm, Staverton, Totnes.

This holding consists altogether of 366 acres, of which 221 are arable, 107 pasture, and 38 orchards. The chief part belongs to the Ecclesiastical Commissioners, who are owners of a considerable estate in the district. The late Mr. Hill (husband and father respectively of the present tenants) entered upon one portion, including the house, at Lady-day 1851, and upon a second (130 acres) in 1865. In 1873, seventy more acres were taken, and in 1880 a further addition was made, which brought the farm up to its present dimensions. Upon the death of his father, the present Mr. Hill, then a lad of 14 years of age, was brought home from school to assist his widowed mother in the management of the farm, and when old enough was made a joint tenant in the occupation. Together they have for several years carried on the holding, each taking an active part in the work which falls to his or her share. The condition of the farm, and the excellence of its whole management, reflect much credit upon both mother and son, for having so successfully overcome the trying difficulties in which circumstances had placed them.

The farm is situate about $3\frac{1}{2}$ miles north-west of Totnes, and half a mile from Staverton Railway Station. It is very undulating, but the soil being light, and overlying a dry rocky subsoil, the work of cultivation is comparatively easy. One feature in which the farm is so thoroughly representative of Devonshire is the number and smallness of the fields, and the height and width of the numerous division fences. The total number of inclosures is 90, of which 13 are under one acre (mainly orchards), 14 others under two acres, 17 between two and four acres, 23 between four and six acres, and 23 between

six and nine acres. The largest is 8a. 3r. 7p. The length of fences dividing these fields (exclusive of $9\frac{1}{2}$ miles of boundary and road fences) is 10 miles. The gates number 200, and as they cost, with their ironwork, 15s. apiece, to say nothing of the posts or pillars of masonry at each side, their erection and maintenance locks up capital which might be more usefully applied elsewhere. The present tenants scored some points in the competition because of the very efficient way in which every gate on the farm was hung and attended to. Not a single one was found which did not open and shut most freely. Mr. Hill has during his tenancy removed $2\frac{1}{4}$ miles of old banks, averaging five to six feet in width, and he might continue the work with advantage.

The buildings of the farm, unlike most others on the Commissioners' estates, lie scattered, and somewhat inconveniently, the result, doubtless, of three or more farms being thrown into one. Some useful sheds have been erected within recent years.

The arable land is cropped mainly on the following rotation, viz.:—First year roots, second barley or oats, third roots, fourth wheat or barley, fifth seeds—left down four or five years. Thus about thirty acres are laid down each year, and the same extent of lea broken up. As there is no large town near, from which supplies of stable and other dung can be drawn to supplement the home production, Mr. Hill has to be less lavish with the latter than his two more successful competitors can afford to be. His farmyard dung is applied mainly to the mangel crop, and to a field of old meadow grass which is mown yearly. The fertility of the other land has, therefore, to be maintained by dressings of artificial manure and lime, and by a liberal consumption of corn and cake by sheep fed on the turnip and other crops. The average expenditure for manure and feeding stuffs purchased during the last four years has been 366% per annum, in addition to the value of home-grown corn consumed.

The result of this management, as testified by the various crops of corn, grass, and roots, is eminently satisfactory, and proves that fertility can be maintained if the ordinary resources at command of all farmers are judiciously applied. This was specially noticeable in the unusual growth and abundance of herbage in the majority of the grass fields on the Judges' second visit in June. Field after field is described in their books as "very full of grass," even where the land was said to have been eaten bare earlier in the spring. Indeed, in some instances the question cropped up whether or not certain fields would not have been better mown than grazed, so thick and forward was the herbage in them, and so plentiful was the grass in the other pastures all over the farm. This abundance of grass was all the

more extraordinary in view of the large proportion of sheep and other stock maintained on the farm, as shown in the following Table:—

		Messrs. Hill's farm	Devon	England
Cattle	per 100 acres .	16.66	20.47	17.41
Sheep	" "	128.68	69.74	63.34
Cattle and sheep	" "	59.56	43.72	38.54
(reckoning 3 sheep = 1 cow) .				

It was not in growth and quantity of herbage only that Mr. Hill's grass crops excelled, but in quality also, for clovers and rye-grasses of all kinds were abundant, and seemed to retain their hold for long periods. Indeed so kindly does the land take to grass, that sundry fields which were laid down with a mixture for one or two years only, were allowed to continue longer, and one field in particular, in which seeds were sown for a catch-crop only in 1888, Mr. Hill has not yet had the heart to break up. The seeds in this case were sown with a corn crop to provide early spring feed for ewes and lambs, and to be ploughed up and planted with turnips in the same year. This is a common practice with Mr. Hill, as he finds it provides him with early keep for his flock, and the land can be got ready in ample time for swedes or common turnips, which are not usually sown in the district until after Midsummer.

Much of the abundance of the clovers is due to the free use of lime and bones. The former is applied chiefly to lea just before breaking, and at the rate of eight to nine hogsheads per acre. This costs 2s. 9d. per hogshead at the kiln, which is three miles distant, and is estimated to last seven years. A cart holds two hogsheads. Bones are used for root crops in conjunction with artificial compounds, and applied at the rate of 2½ cwt. each of ½ inch bones, dissolved bones, and mineral superphosphate. Occasionally some nitrate of soda and kainit are added.

The old pastures were likewise very full of grass, and showed that they had been equally well attended to. The herbage was very rich and full of clover. No cows could wish for more luxuriant grazing ground, nor need any greater stimulant for the production of milk, than Mr. Hill's were rejoicing in on the high ground just above the house.

The cattle kept number about 60. Of these about 18 are cows in milk, and the remainder are their produce of various ages. All calves are reared, and the heifers are bred from and take the places of the older cows as they come into profit. The steers are fed off at three years of age. Thus every head of cow stock has been reared on the farm. It is hardly necessary to say that they are all "South Hammers," and that the dairy cows show

fair milking capacities. The young stock did not seem as good as they should have been from such dams, but this is frequently noticeable in the South Hams breed. More careful selection, however, of sires would do much to correct this failing. The work of the dairy falls to Mrs. Hill's share, and right well is it looked after. Up every morning at five o'clock, Mrs. Hill is able personally to superintend the scalding of the milk, and the making up of the butter, which is done daily. Cream is sent by parcel post to distant places, such as Torquay, Bath, and Cheltenham, and is sold at the same price per lb. as butter. Milk and butter are sold retail to the villagers and neighbours, and the surplus butter is sent to Totnes on the weekly market day. One woman and a girl are kept in the house to assist in the dairy and house work. The former also assists in the milking of the cows, having generally 10 allotted to her, but if more she is paid an extra 4*d.* a week for each one.

A breeding flock, of about 235 ewes, of South Devons is kept and their produce reared. The ewe hogs are mostly retained for the flock, the draft ewes being usually sold into the eastern part of the county, "the land of water meadows," where they are crossed by Shropshire or Hampshire Down rams, and fed off with their lambs, which arriving early go off soon at top prices. The wether hogs are fed off the following spring or summer, about one half being kept on until after shearing time. Those seen were estimated to clip 16 to 17 lb. of wool in the grease. The ewes and hogs were in excellent condition, many of the former too much so when compared with the condition of their latest lambs. Evidently the breed are not good mothers, as was noticed on many of the farms, and they do not produce as large a crop of lambs as various other sorts do, Mr. Hill's 235 producing only 290 lambs or barely 1½ per ewe. In other cases the judges heard of even less increases, and were informed that if one lamb is weaned for each ewe put to the ram the result is considered satisfactory. The other stock on the farm consists of eight work-horses, three colts, and one riding hack; also three sows and their latest produce.

The labour bill amounts to 300*l.* per annum, which covers the wages of six men and four boys. Three pairs of new cottages, and one old one, are included with the farm, and are let to the labourers at the rate of 2*s.* 6*d.* per week. The new cottages are some of several pairs which have in recent years been erected in the district by the Commissioners at an estimated cost of about 500*l.* per pair. They are neat and substantial erections on excellent sites, and contain three bed-

rooms, sitting-room, kitchen, and back kitchen each. A small garden is attached to each cottage, and in it the tenant grows some early crops of potatoes and other vegetables.

One special feature of the management of this farm is the manufacture and treatment of cider, to which considerable personal attention is paid by Mr. Hill, and for which he is rewarded by the great demand for his production. The 23 orchards are most carefully attended to; the trees regularly manured, and pruned, and all vacancies at once filled by young and healthy plants from a nursery on one part of the farm. Mr. Hill has for four years in succession won local prizes for the best-managed orchard. Great attention is paid to the selection of the sorts or varieties of apples, and so much is Mr. Hill's knowledge of the subject recognised and appreciated that he does no small trade in the supply of suitable fruit trees for various localities. One nurseryman alone is growing 2,400 trees for him from which to supply his needs. Just now he is making trials and notes of sundry table sorts with the view of entering upon their more extended growth. In addition to the produce of the farm, apples from neighbouring orchards are purchased, and converted into cider.

Great care is taken in the selection of fruit for each grinding and pounding, and in the special treatment of the product according to the varying degrees of ripeness in the apples. Sweet and sour fruits are mixed in careful proportions such as experience has proved to be productive of the best cider, and care is taken to keep the first "falls" by themselves, as they produce only rough cider. The middle crop is most preferred, and the month of November, from the 10th onwards, is considered the best time for the pounding. After the juice has been extracted and put into casks the time comes when Mr. Hill's personal attention is most devoted to its manipulation. Each cask or hogshead is daily examined and tested, and if any special treatment is found to be necessary, he makes a note of it on a card which is attached to the top of the cask. The man whose time is chiefly employed in the cider cellar during the autumn and spring goes round afterwards and carries out the written instructions. The result of this close and careful attention is the production of a superior article for which Mr. Hill has a sufficient demand from private customers to enable him to do without the middleman. He thus realises prices which are considerably above the ordinary run, and makes this branch of his farming a remunerative one. If other farmers in the county were to devote the same care and attention and business abilities

to the production of cider, their orchards would be much more remunerative than they hitherto have been.

The Judges were so favourably impressed with the successful management of this farm in general, and of the cider in particular, that they ventured to recommend Mrs. Hill and her son for a third prize, which the Local Committee very liberally and considerately granted.

CLASS I.—COMMENDED FARMS.

Occupied by Mr. J. S. Ford, Senior, Hall Torrs, Yealmpton.

This farm lies close to the picturesque village of Yealmpton, about 7 miles east of Plymouth, and between 4 and 5 miles from the Plympton and Ivybridge railway stations. For depth and richness of soil, and natural advantages, this farm is one of the most favoured in the competition. No finer grazing ground can be wished for than some of the old pastures, whilst the crops on the arable land show that the soil is a grateful one, and repays liberal treatment. Mr. Ford has held the farm since 1878, when he succeeded his father, who had been upon it for 42 years. The cropping and cultivation of the arable land are upon much the same lines as on the farms already noticed. The fields are square, and of fair size, and many old fences have from time to time been removed. Indeed, the farm bears many evidences of having been well managed and looked after in the past. A considerable extent of stone facing to the fences has been done in years gone by, and some 40*l.* has been expended in such work by the present tenant within the last three years.

The stock are good all round, though perhaps not quite so numerous as the farm is capable of carrying. Formerly, Mr. Ford was an admirer of Shorthorns, and kept a small herd, but although successful with them in the show-yard, he was no more able to induce his neighbours to appreciate their good qualities, and to substitute them for South Hammers, than sundry more recent breeders of the "red, white, and roan" have been.

For some years, therefore, he has devoted his attention to the local breed, and has met with more success. Six heifers and a bull were on both occasions of the Judges' visits being fed and got ready for exhibition at Plymouth, where they afterwards won three first prizes, one second prize, and a commendation. The sheep also are worthy of mention, as they were an excellent level lot, showing much aptitude to fatten, and carrying heavy fleeces of wool. All of them were of Mr. Ford's own breeding. In January some of the early lambs were ready for the butcher,

and one in fact had been sold for 2 guineas for a feast to which the Judges had been kindly invited.

Upon the whole, the management of this farm, although not quite up to that of those to which the prizes have been awarded, is worthy of special commendation.

Occupied by Mr. William Lawry Treveor, Gorran.

This, the only farm in Class I. which is in Cornwall, is situate ten miles south of the town of St. Austell, where is also the nearest railway station. The country around is an open one, and has hardly any hedge-row or other timber. The soil is mainly light and easy to work, and being near the sea-coast the climate is moist. The cropping is very similar to that in Devonshire which has been reported upon, except that occasionally dredge corn is taken in immediate succession to some other cereal crop.

Some fields have been laid down to permanent pasture by the present tenant, and sundry new fences erected. In fact some little improvement is constantly being made.

Four dairy cows are kept and their calves reared, and many steers and heifers are bought for grazing and are fed off. The total head on the farm numbers 82. They are mainly crossbred Guernsey and Shorthorn. Pure Shorthorns have been tried occasionally, but they have not always been successful. The sheep are "South Hams," and are described in the Judges' notes as a very uniform good lot. Rams are bought at Totnes or in that neighbourhood, because there the wool retains its quality and staple, which is not the case in Cornwall, where after exposure to the climate it gradually deteriorates.

Mr. Lawry, who has been on the farm twenty-three years, has been a tolerably regular visitor to the Royal show-yards, and has there occasionally purchased new implements which took his fancy. He has, therefore, a good assortment of modern and new implements (such as self-binding reaper, thatch-maker, &c.) mixed up with sundry old-fashioned and clumsy ones for which Cornishmen still retain their fancy. The average yearly sales of stock and crops range from 1,300*l.* to 1,500*l.*, whilst labour is 250*l.*, and artificial manures cost about 200*l.*

CLASS II.—FIRST PRIZE FARM.

Occupied by Mr. E. Cornish, East Farm, Charleton, Kingsbridge.

This farm consists of 182½ acres, of which 141½ are arable and the remainder in grass and orchards. It is situate about

2½ miles from the small market town of Kingsbridge, which is 11 miles from the nearest railway station. The tenancy is a yearly one, held under Lord William Compton, and has now existed for seven years. The rent and rates amount to about 320*l.*, the former having been reduced from 470*l.* since the tenancy commenced.

The house is a new one, and is built on a larger and more ambitious scale than are most farm-houses in the county. The dairy is large and well ventilated, and the rooms are spacious and lofty. The farm-buildings are, however, much scattered and inconvenient, and in unsuitable situations. Some cattle boxes and yards have recently been erected. Water is laid on in the yards, and useful drinking-troughs are provided. In one of the buildings, in which there is a root-store with a loft over, an opening has been left in the floor of the loft through which roots can be tipped from above direct from the carts which are backed to the opening, but prevented going too far by wooden blocks.

The farm lies on a hillside facing south-west, and rises gradually from a small estuary of the sea (on which is a landing-stage or wharf for the use of the farm) to a height of 350 feet at the highest point. From this latter the open sea is visible at three points of the compass.

About 50 acres of corn and 36 acres of roots are grown annually, the remainder of the arable land being in rotation grasses of various ages. No definite course of cropping is adopted. The wheat sown is mainly Fenton's White, or the Red Chaff White, and is drilled in rows 6 inches apart at the rate of 2 bushels per acre. Some of the corn crops were very promising and all very forward. Some trifolium and winter vetches are sown, parts of which are mown and taken to the yards for horses. The remainder is eaten by sheep twice and occasionally (as this year) three times. The crops are mainly dunged at the rate of 15 to 20 loads per acre, with an addition of 5 cwt. of mineral phosphate. Where no dung can be had, 5 cwt. bone phosphate is substituted. All the swedes and turnips are eaten off by sheep, which get also cake and corn. The first year's seeds are mown after being dunged, the second and third years' are grazed. After this they are generally ploughed up and followed by roots. All the rotation grasses had done well, and in some of the fields near the house the first year's lea for mowing was remarkably full and heavy.

The permanent pastures are most luxuriant, and have been thoroughly well treated. One field of grass intended to be mown was very full of the richest herbage. There are some

water meadows which are regularly irrigated when there is sufficient water, but this occasionally runs too short to cover the whole area in one year. Provision is made for all the drainage from the homestead and other buildings and yards being added to the water used for irrigation. The land which had been covered in the spring was full of grass at the time of the Judges' second visit. Considering that the farm has no advantage of situation for obtaining dung other than that produced on the farm, and also that Mr. Cornish's expenditure in artificial manures is only from 50*l.* to 60*l.* per annum, the land is in remarkably good heart, and is growing crops that cannot fail to be remunerative. A large quantity of dung is, however, made in the sheds and yards at home, and much of it under cover in the boxes during the whole winter.

The orchards are well attended to, several young trees having been planted since the tenancy began and carefully pruned and protected. Cider is made for home consumption only. The fences and banks are kept neatly, and much stone-facing has been done by the tenant, who has paid 40*l.* for stones for this purpose alone.

Thirty-seven head of cattle were on the farm in January, and 30 head in June. Of these, 10 were dairy cows or heifers in milk, all showing great milking qualities, the remainder calves and steers of various ages. Between the visits some of the cows had aborted, and so there was not the usual number of young calves being reared. The cattle were all South Hams of nice quality and with an aptitude for putting on condition. In January nine head in all, chiefly steers of about 2½ years of age, were being fed for the butcher and were thriving well, although not getting much in the way of artificial food. Most of the cattle were bred on the farm, and are descended from the stock of Mr. Cornish's father, who is an old breeder and has gone occasionally to the Somerset Devon for a cross to keep up quality and feeding properties. The 11 bullocks fed last year realised 256*l.*

Good as are the cattle on this farm, they are excelled by the sheep, which are "South Hams" and as fine a lot as can be found in any part of the county. These, likewise, are descended from the flock of Mr. Cornish, sen., who is acknowledged to be an excellent breeder and judge of all kinds of stock. About 60 breeding ewes are kept, and are put to a South Ham's ram. Of the produce, the best of the ewe hoggs are retained and added to the flock, the wethers are sold off fat in the spring, whilst the draft ewes go the same way later on. Seventy-four sheep sold last year averaged above 55*s.* each, the wethers

making from 61s. to 66s. each. Some rams are reared for sale for breeding purposes. All the sheep are well kept, and when feeding for the butcher get cake and corn daily. The lambs are favoured also, as Mr. Cornish believes in keeping "young things going." The ewes were all in grand condition. One hundred and forty-five sheep were shorn in 1890 and averaged 13 lb. of wool per fleece in the grease. At a recent local Show this flock was awarded three first and two second prizes in three classes, and in fact all but "swept the decks."

The horses were as good for their part as the other stock. Indeed, no better were seen on any farm during the inspection. The six work horses are smart active animals, and it was quite a treat to see the quick way in which they moved when ploughing, and how they "whipped" round at the end of each double furrow. A brood mare and her colt, and a harness nag, complete the stud.

The labour bill amounts to about 170*l.* per annum, exclusive of the value of three cottages which are held with the farm, and of some potato ground and its cultivation. Mr. Cornish himself frequently lends a hand, and does sundry lots of sowing and other work in busy times. The whole farm is worked at a light expense, but is, nevertheless, in a condition surpassing many another on which the expenditure in labour, manure, and feeding stuffs, is proportionately greater. The management and quality of the stock also contribute much to Mr. Cornish's success.

CLASS II.—SECOND PRIZE FARM.

Occupied by Mr. J. S. Ford, Jun., Luson, Holbeton, Ivybridge.

Mr. Ford, who is a son of the competitor of that name in Class I., occupies two adjoining farms which lie 10 miles south-east of Plymouth, and six from Ivybridge, which is the nearest railway station. One farm belongs to Lord Revelstoke, whose residence is close by, and the other to Mr. H. B. Mildmay, of Flete, which is between two and three miles away. One formerly belonged to Mr. Ford's father, who sold it to the present owner a few years ago. The farms together comprise 172½ acres, of which 145½ acres are arable and 27 pasture, and are fairly convenient for joint occupation. The tenancies are yearly, and the rents, tithes, and rates amount to about 40s. per acre. The house in which Mr. Ford resides is a comfortable and convenient one, and the buildings generally provide ample accommodation, although from the nature of circumstances the latter are somewhat scattered. Some of them are new, and

all of them are in good repair. The other house is divided into two cottages for labourers.

The soil is mostly heavy, overlying a clay subsoil, and in some places a loose rock. The cropping of the land varies according to the nature of the soil, the heavy portion being of course more frequently planted with wheat, and the lighter with barley. In some fields where the soil varies, the kind of corn crop is varied also. This year there are 22 acres of wheat, $18\frac{1}{2}$ of barley, 7 of oats, and 30 of roots. The remainder of the arable land is under rotation-grasses of one, two, or three years' sowing. The wheat, chiefly Golden Drop or Cambridge White, is on the whole fairly good, but one field has been much thinned by wireworm. Last year one field averaged 40 bushels per acre. Barley is a promising crop, and one field of black oats after three years' lea is a remarkably strong one.

Mr. Ford has not yet had the farm long enough (only five years) to get into a regular rotation, and has in a few cases had to follow one corn crop by another. This has limited his opportunities of clearing the land of his predecessor's legacies. Where two crops have succeeded each other, some 3 cwt. of artificial manure has been sown for the second crop. One field of mangel is after potatoes which followed oats. The potatoes got 20 carts of dung and 12 hogsheads of lime per acre, and the mangel got 7 cwt. of special manure. Another field of mangel is after old lea. This had dung on the grass in 1889, then lime, six hogsheads (= three tons) per acre mixed with soil, and, in 1890, 7 cwt. of dissolved bones. The swede crops get 7 cwt. dissolved bones and mineral phosphate per acre, and in some cases dung as well at the rate of 10 to 12 cartloads. Where dung is used the roots are carted off, but where none is used the turnips are fed off by sheep. Some rape is sown after wheat and then fed off. The first year's lea is mown, and dung applied afterwards, as Mr. Ford finds the succeeding grass crops are better under this plan than where the dung is applied for the first mowing. The land does not take very kindly to grass, though where lime has been recently applied the clovers and grasses hold much longer and better.

Most of the pasture land has only been recently laid down. There are two water meadows which are irrigated a week at a time—between Michaelmas and Ladyday—with water from a pond in the yard, through which a small stream runs, and which receives all the drainage of the yards and buildings. The carriers are well laid out, and extended to as high a level

practicable. These water meadows were full of grass in June, and well calculated to flush the milk of some fine dairy cows which were grazing on them.

The orchards extend to four acres, and are well looked after. Each tree gets a dressing of dung or compost yearly, and the pruning, &c., is duly attended to. Forty hogsheads of cider were produced last year, half of which were sold off unracked at from 25s. to 30s. each.

A small herd of dairy cows (10 to 12 South Hammers) is kept, and the produce reared. Some of the cows are exceptionally good, and the young stock promise to maintain the character of the herd. One two-years-old bull of Mr. Ford's own breeding was a thick good animal, with level back, even flesh, and a fine masculine head. A younger one, recently purchased from a good herd, has, like so many young South Hammers, room to develop and furnish, but at present is not equal to the home-bred one. The cows are arranged to calve between Michaelmas and Ladyday, when butter realises the highest prices, and when calves are said in the locality to rear best. The cows are well kept, and the best milkers when in full profit get cake and bran and oats. The rest get bran and oats even when on grass. The total head in January was 41, including two bulls, and in June a similar number—the places of the steers fed off in the spring having been taken by calves born since. The cattle were a very even and good lot, and seemed able to thrive and milk hard at the same time. One heifer had been shown three times, and had been placed first on each occasion. All the cattle were in capital condition.

About 100 breeding ewes (South Hams) are kept; 30 of the ewe hoggs are added yearly to the flock, whilst the remainder and the wethers are fed off for the butcher in the winter and early spring. Some ewes and lambs of 1890 had gone off fat before the June visit at 78s. "the couple," viz. ewe and lamb. The sheep are well fed and kept going. In January the hoggs and wethers were getting 11lb. oats and $\frac{1}{2}$ pint maize daily, on cabbages and turnips, and in June those for the butcher were having $\frac{1}{2}$ lb. cake daily. The lambs are weaned early in May, and get a little cake or corn for a short period to prevent their going back in condition. Rams are bought generally from Mr. Ford, sen. One of these had taken 1st prize at Yealmpton, in a class of seven.

The five horses are a good, useful, and active lot, and show more breeding than is common in the county. One had recently won first prize at a local show. Two smart active hackneys are also kept for Mr. Ford's riding. Thirteen black pigs, some

ducks and geese, and 150 cocks and hens complete the list of live stock.

The labour bill amounts to about 15s. per acre, and purchased feeding stuffs and manures cost 250*l*. Corn and other produce last year realised between 450*l*. and 500*l*., and live stock sold for about 700*l*.

An excellent and simple system of accounts (Elliott's Farmers' Account Book) is kept, in which columns and pages are prepared and filled up for a year's transactions under each department or heading. The method is exceedingly simple and clear. A balance-sheet and valuation is made each year. Mrs. Ford lends a hand very frequently at these accounts, as well as looking after the dairy work.

CLASS II.—HIGHLY COMMENDED FARM.

Occupied by Mr. Charles Horn, Blowiscombe, Yelverton.

This farm lies at the foot of the western fringe of the Dartmoor Forest, and participates in the rougher climate which prevails in that district. It is seven miles south-east of Tavistock, and a similar distance north-east of Plymouth, and contains 159½ acres, of which one half is arable and the other half grass. Mr. Horn has been tenant for four years only, and has, therefore, not had time to get all the arable land into equal order and condition. But he is going the right way to work, and in course of time may take a higher position in a similar competition. His old pastures, and some fields which have recently been laid down, show signs of much liberal treatment. In one of the former there was the unusual sight of the ox-eye daisy, generally so indicative of poverty, growing in the midst of most succulent clover, which is frequently taken as a proof of fertility. The daisies were significant of previous poor treatment, whilst the latter was the result of recent applications of forcing dung. A continuance of the latter will soon eradicate the former. A field of meadow grass intended for hay was an especially heavy crop, and full of good herbage. It has been mown regularly during the tenancy, and has received a coating of dung (eighteen carts to the acre) directly after the removal of the hay crop.

A dairy herd of twenty cows is kept, but its management differs from that on the other farms reported upon in one important point—namely, that the cows are sold as soon as they have produced their second calf. This is the time when, as a rule, they realise most money, because of the demand for them

by dairymen and others. The calves are retained, and the heifers bred from early, to keep up a succession of calvers for this heavy draught upon the number of dairy cows. The heifers are well fed, especially after they have first calved, so as to keep them growing, and secure their being in good condition when the time for their sale arrives. Thus about ten cows are sold yearly, and ten first calved heifers added in their place. The steers are fed, and seven or eight go off yearly.

About fifty ewes (Improved Dartmoors) are kept, and part of their produce sold as fat lambs. Twelve had gone in June at 35s. each. The hogs are kept until after clipping time and then sold fat.

Three horses do the work of the farm. A chestnut colt bred here was by a sire of the "old packhorse" breed—a breed for which the district was at one time very celebrated, and from which many a four-horse team has been taken direct from the plough to a nobleman or gentleman's stable.

Hardly any corn is sold, but what little is grown is mainly consumed on the farm, in addition to 150l. worth of cake and maize. Much lime and artificial manure have been used lately.

On this farm is the best and most convenient set of buildings met with. Indeed, so excellent is the arrangement, and so reasonable the cost—1,000l.—that a plan (Fig. 2, on page 809) is, with the permission of the landlord, here submitted, with one other comment only—that if means had been provided for carting on to the loft (to get the corn sheaves to the threshing machine, &c.) the arrangement would have been perfect. In this, and in other respects, Mr. Gill has been an improving and encouraging landlord. He appreciates Mr. Horn's efforts to farm well, and since the prize awards have been made known has presented him with manure sufficient for twelve acres of permanent grass.

CLASS II.—COMMENDED FARM.

Occupied by Mr. Henry Quartly, Molland, South Molton.

This is the only competing farm which lies in North Devon, being situate close to the northern boundary of the county. The approach to it from Dulverton, picturesque and interesting as it may be to the tourists who frequent that locality, is not an inviting one to the searcher after prize farming, as it offers him but little prospect of success. But appearances are at times very deceptive.

The farm was formerly in two holdings, in one of which

(Brimley, 117 acres) Mr. Quartly succeeded his brother in 1875, and the other (Rowry, 58½ acres) he has rented since 1882. The whole belongs to Sir W. Throckmorton, Bart., of Southdown fame, who is owner also of a considerable extent of land in the neighbourhood. Attached to the farm is a right of common over Molland Moor, which is about 3,000 acres in extent, and forms part of the Exmoor range of hills, or "downs" as they are locally called.

Much of the land is too steep for cultivation, and, indeed, were it not for the necessity of growing root crops, Mr. Quartly would prefer not ploughing at all. As it is, when any field is broken up it is laid down again as soon as possible, with as many root crops and as few corn crops intervening as practicable. Thus the cropping of one field ploughed out of lea in 1888 has been swedes and mangel in 1888, mangel and swedes in 1889 (the mangel this year following the swedes of previous year, and *vice versa*), whilst in 1890 the whole has been sown with rape and vetches mixed, and seeded down with the following mixture:—Rye-grass (Devon eaver) 3 pecks, red clover 4 lb., white clover 2 lb., alsike 2 lb., and ribgrass ½ a peck. The land in the meantime is treated liberally with dung and artificials, and excellent crops of roots, especially of mangel, are grown, though some of the fields are at an elevation of 1,000 feet above the level of the sea. Some kohl-rabi is grown, being treated exactly as swedes, and the Judges were assured the crop is quite equal to the latter.

A considerable area is "watered" by irrigation, for which Mr. Quartly has at his own expense cut several carriers. The liquid manure from the farmyard is allowed to run into the stream which is used for this irrigation, and so well has it answered that Mr. Quartly considers that the land has been trebled in agricultural value. Where the water cannot reach, artificial manures are applied.

Lime has been used fairly freely and (with the view of making experiments) in two fields certain strips of land in the centre were left unlimed. The actual line of application was clearly defined by the difference in the herbage, and by the cattle grazing more closely on the limed than on the unlimed land, although in one case 6 years have elapsed since the lime was applied.

The farm is essentially a sheep farm, and its management is chiefly directed to that end. A breeding flock of 130 to 140 Exmoor ewes is kept, and its produce retained until fat and ready for the butcher. The wether hogs are fed well during winter and in their second summer, and go to the butcher in

the following August and September, when the tourist season at the neighbouring seaside places of resort is at its height, and when the tenderness and delicacy of flavour in Exmoor mutton are highly appreciated. The ewes are turned on the adjoining moor about Midsummer (or just after clipping), taken off for tupping about the end of August, and put on again for a fortnight after. The draft ewes go southwards in the early autumn, and are there crossed by Devon Longwool or South Devon rams, and, with their last crop of lambs, fed off. Mr. Quartly's uncle was much celebrated for his flock of Exmoors, and won many prizes at Smithfield and elsewhere. Many of the sheep to-day at Brimley are descended from his flock. Little need, therefore, to say that the Judges greatly admired their neat compact frames and fine wool, which do credit to their sire, who has been successfully exhibited at local Shows.

Being a "Quartly" also, what wonder that the present competitor should have inherited a decided love for and discerning judgment in the selection of "North Devons" to stock his farm with? Some of the cattle are descended from the old Quartly stock which has been for many years so frequently in the Royal and other prize lists, and are themselves prize winners. The latest addition to the herd is a recent purchase for 32 guineas of a heifer at Lord Falmouth's sale.

The climate and drawbacks of situation placed Mr. Quartly at a disadvantage in the competition, but the Judges considered him deserving of commendation for his persevering efforts to overcome the physical difficulties of his holding.

CLASS III.—FIRST PRIZE FARM.

Occupied by Mr. J. W. Lawry, St. Mellion, Saltash.

The Judges' visits to this farm were some of the most interesting periods of their inspection, for here they met with an instance, and a most gratifying one it was too, of what a man of enterprise, perseverance, and intelligence can accomplish, not only in the profitable cultivation of land, but in the establishment and promotion of a local industry which is calculated to confer beneficial advantages upon his poorer neighbours.

The farm comprises 60 acres of arable land, $9\frac{1}{2}$ of pasture, and 30 of orchards and fruit gardens. The greater part is held under a yearly tenancy from the Earl of Mount Edgcumbe, and is situate in Cornwall, on the banks of the River Tamar, which divides the two counties. Mr. Lawry was born and brought

up on the farm, and succeeded his father as tenant 24 years ago. Since that period he has converted a material portion of the land into orchards and fruit gardens, and has developed a trade or traffic in the growth and sale of fruit, which has been profitable to himself and beneficial to the district at large.

If, in this report, prominence is given to Mr. Lawry's fruit farming, to the curtailing of the record of his other management, the reader must not assume that the latter has few points worthy of record, but rather that the former is in the writer's opinion of so much more absorbing interest as to demand all his available space. Fruit farming, and its application to small holdings, has of late been such a fruitful subject of discussion that a record of its successful practice cannot fail to be of more public interest than a mere reiteration of the best of ordinary farm management.

Briefly then, the arable land this year is cropped as follows, viz.: wheat 4 acres, oats $3\frac{1}{2}$, barley 6, mangel 2, and other root crops 4, the remainder being in seeds of various duration. The land is clean, and well managed, and is made to produce heavy crops of corn and roots. No finer crops of mangel or turnips were seen anywhere than here, and one crop of white turnips deserves especial mention because of its being the second crop on the land during the year. The field was sown in the autumn of 1888 with winter oats, which were harvested about the middle of August 1889, then dunged, ploughed, and sown with common turnips, and a right good crop resulted.

The mangel crop was estimated to weigh upwards of forty tons per acre, and was little short of that grown the previous year, for which a second prize had been awarded in a local competition. Mr. Lawry attributes the weight and success of his crop to the fact of the plants being left thicker on the ground than usual, because of the rows being only nineteen inches apart and the plants singled out to ten inches. The excess in the number of roots at these distances over those at 2 ft. by 10 in. is 7,500 per acre. All the green crop land (except that for mangel) is sown with either trifolium or vetches, and the produce made into silage in a silo which is fitted with an apparatus of Mr. Lawry's own invention, for lifting the heavy stones used for weighting.

All the dung produced on the farm is applied to the arable land, and is supplemented by bones, guano, and nitrate of soda. The expenditure in purchased artificial manures and feeding stuffs averages 250*l.*, in addition to some hundred tons (weight) of town manure, which is brought from Plymouth by barge to a wharf on the river boundary. This latter manure is applied to

the orchards and strawberry ground. Seven acres of the grass land form part of a plot of about 150 acres which was reclaimed by Lord Mount Edgcumbe from the River Tamar about twelve years ago, and which, when let separately, now realises 2*l.* to 3*l.* an acre in yearly rent. When first reclaimed the land was full of holes and hollows into which cattle and horses were apt to sink. These holes had to be filled up by spade labour. Afterwards the land was trenched two spit deep, then drained, and afterwards limed at the rate of 4½ tons per acre, put on hot. Two crops of oats followed, then the land was summer fallowed, and afterwards laid down to permanent pasture, which is now capital grazing ground. The landlord paid for the embanking and draining, and the tenants did the remaining work of reclamation, getting the land at a nominal rent for the first year or two. Mr. Lawry spent 100*l.* in labour in reclaiming his portion, but doubts if either he or his landlord has yet derived much benefit from the outlay. Part of the land is now planted with plums and raspberries.

Ten cows are kept for dairy purposes, and are mostly cross-bred Shorthorns, and Guernsey. These are put to a Shorthorn bull, the present sire, bred by Mr. Treadwell, having been bought at the Birmingham sale in 1889. The calves are all reared and fed on the farm until matured either for the herd or butcher. About forty-five ewes, chiefly Dartmoors, are bought each autumn, and put to a dark-faced and short-wool ram (either Hampshire or Shropshire, or a mixture of both). The lambs are pushed on from birth, so as to go off fat as early as possible. The ewes also are well fed, and sold to the butcher during the summer. The increase in this flock had been three lambs to each pair of ewes. A few pigs are fed, and a lot of poultry kept and reared. The receipts for the latter amount to about 70*l.* per annum. Three horses are kept.

The labour bill for the whole averages from 400*l.* to 500*l.* per annum, but fluctuates according to the abundance or otherwise of the fruit crops; a good cherry year entailing quite 20*l.* a week extra during the picking season. The ordinary rate of wages is 15*s.* a week, for about nine months of the year, when the men work from 7 A.M. to 5.30 P.M., but in "picking" time they are raised to 20*s.* per week, with no limit as to hours, and when work frequently commences between 4 and 5 A.M. For cherry picking, 24*s.* to 26*s.* per week is given to men accustomed to the work, and who are careful not to damage the trees whilst "gathering." But this is an uncertain crop, as, for instance, in 1887 Mr. Lawry sold 18 tons of cherries, but in 1889 only 15 cwt. In "strawberry" and "bush fruit" times forty

to fifty or more extra hands, mainly women and girls, and school children, are engaged, the latter earning during the six weeks' holiday 6s., 8s., or 10s. a week, apiece, according to age. As many as 3,000 punnets of strawberries have been gathered and sent off in a day. The figures in the balance-sheet of the agricultural portion will bear comparison with those on most farms, but it is upon the fruit crop that Mr. Lawry relies mainly for his profit, although this is not now what it used to be. In the "good old times" he has sold as much as 1,000*l.* worth of fruit in a season, but now, owing to increased competition, the prices are quite a third less than they were ten years ago, and the middleman gets a full share of the price paid by the consumer. Mr. Lawry has also a lessened area under strawberries, consequent upon the land which was first found most suited to their growth having become "sick" or "tired" of them. Still, despite all these drawbacks, the gross receipts on the whole farm amount to about 15*l.* per acre, on an average of seasons. A difference of 10*l.* per ton in the price of strawberries or raspberries, and a corresponding difference in the same season between the "jam" and "dessert" markets, will materially affect the balance-sheet of this farm.

The history of Mr. Lawry's first introduction to this branch of his occupation deserves recording, because it shows the enterprise and dogged determination to overcome difficulties which are his marked characteristics. Being in London for the purpose of seeing the Exhibition of 1862, he strolled early one morning into Covent Garden Market, where his attention was attracted to the prices asked for strawberries. Knowing that his father had in his little garden, in Cornwall, some fruit which was quite equal to that for which such high prices were asked, the idea struck him to have some forwarded to him to try to sell. He wrote his father accordingly, and all was sent him that could be found, but, owing to ignorance in the art of packing, the fruit, on arrival, was quite unsaleable. But Mr. Lawry was not disheartened; so, instead of grieving at his failure and abandoning the project, he set to work to overcome the difficulties, and with such success that shortly afterwards his fruit became the earliest, and obtained the highest prices, in the London, Manchester, Liverpool, Edinburgh, Cardiff, and other markets.

To the present day the district continues to supply the earliest "out of door" fruit in the kingdom. Directly upon his return from London in 1862, Mr. Lawry planted as much land with strawberries as was available, and set to work to get more ready until, in about three years, he had quadrupled the area under that crop. This went on increasing until either all the suitable

land had been cropped, or the prices realised had by reason of increased competition considerably fallen. In due course the produce from the new plantings (augmented by purchases of fruit from the villagers and gardens around) was sent to London and realised 2s. to 2s. 6d. per lb., which was quite three times the rate of the local market. From the very satisfactory returns of this second venture the extended growth of the fruit became general in the district, and acres of strawberries are now grown where, prior to the casual visit to Covent Garden, only a few yards had been devoted to them.

In the meantime the procuring of "punnets," or little baskets in which to pack the fruit, became a great difficulty, and often Mr. Lawry had to "run up" to London by night in the middle of the season to obtain what he wanted. Here again his indomitable pluck and enterprising skill came to his aid, for he devised the idea of making the punnets at home, and now he is able to produce not only what he requires himself, but some for sale also at prices less than half those he formerly paid. At first the wood from which the punnets were made was prepared by hand-planes, but at Mr. Lawry's instigation, and upon his guaranteeing to take a large quantity, a firm in Plymouth entered upon the preparation of the wood by machinery, and, after many developments of the latter, is now able to turn out material for a large quantity as well as make up seventy gross of punnets daily.

Another factory has since been established in the parish of St. Mellion at which much wood is prepared and tied up in bundles for sale to the fruit growers and their workpeople. This punnet-making is now quite an important local industry in the little village of Boetheric, near which the farm lies, women and children employing their spare hours in the winter months in the work, and making quite a comfortable addition to the family earnings. From what trifling causes do great results arise! The accidental stroll into Covent Garden was, as Mr. Lawry says, practically the making of his fortune, and the foundation of a local industry, which has proved a boon indeed to the residents of a Cornish village.

The fruit is grown on the steep banks alongside the river, and on the southern slopes of deep valleys which open out on either side. Care is taken to select only those sites which face southwards, and are sheltered by the surrounding lands from the westerly winds and spring frosts. A deep and rich soil, however, is not so much sought after as a thin and warm one, because of the latter favouring early maturity. Preference is given to strawberries because of their being the most reliable

and most profitable crop, but in course of time the land gets sick of them, when cherries, plums, apples, and other fruit trees are substituted. Ten years is the average life of a strawberry plantation, though there are plots in the locality which have been twenty years in existence, and are still prolific. The cherries and other tall fruit trees are planted at wide intervals, and the intervening spaces filled with gooseberry, raspberry, and other bushes. The plants and trees are all placed in rows, and the intervening ground is kept open, and free from weeds. Under one portion of a cherry and plum plantation grass seeds were sown some two or three years since, but the practice will not be continued, as the trees are found to thrive and produce best where the ground around the stems is cultivated yearly, and air gets admitted to their roots. On new ground, before the bushes and trees have attained much size, cauliflowers, cabbages, &c., are grown.

New plantations of strawberries are constantly being made to take the place of those which are worn out. In this matter especial attention is paid to procuring the earliest sorts, because they are the most profitable, the early baskets in the market invariably getting the best prices. Mr. Lawry is, therefore, always on the look out for the varieties which have this important quality, and this spring paid 5*l*. for a small hamper of plants which were specially recommended on that account. The few berries which these plants have produced this year bear out their recommendation.

Runners from strawberries are cut off as they appear, except when a bed begins to show signs of decline; then the runners between alternate rows are allowed to take root so as to fill up any casual vacancies. Town manure from Plymouth is mainly used, and is carried on to the ground in handbarrows, but occasionally bones or some artificial manures are applied. A perceptible difference between two adjoining plots which are let to Mr. Lawry's workmen seems to point to pig manure being very suitable. Many old banks and fences have been removed because of their obstructing light and air, and harbouring birds. In their place, alongside the roadways, wire fences have been substituted, although, as Mr. Lawry casually remarked, "when we can get a ton of strawberries a day we don't mind a few birds."

Of the crops this year, strawberries, raspberries, and gooseberries—in fact, all bush fruit—are quite up to the average. Plums also are fairly good; but cherries and apples are almost failures, except one variety of the latter, which Mr. Lawry has recently introduced, and is cultivating on an extended scale

because of its being a reliable bearer. A fig tree was also in full bearing. Upon the Judges' visit on the 11th June, Mr. Lawry had just received his first return for strawberries for the season from Manchester, and was satisfied with the result. This was rather a later commencement than usual, as in some years the first pickings have usually been ready by 23rd May.

The fruit, when packed, has hitherto been sent by road to Saltash Station, which is nine miles away, or by water to Plymouth, and thence transferred to the Great Western Railway, but the recent opening of the new line of the South-Western Railway, with a station at less than half the distance on the other side of the river, will doubtless be found a great advantage, especially as competition between the two companies will probably result in lower freights. At present the rate of carriage to Scotland is 8*l.* 10*s.*, Manchester 5*l.* 15*s.*, Liverpool 5*l.* 15*s.*, and London 3*l.* 10*s.* per ton. As much as 150*l.* has been paid for railway carriage in a season. In connection with this subject it may be mentioned that Mr. Lawry was called as a witness before the House of Lords' Committee on the Railway Rates Bill, and gave evidence as to the charges for carriage of fruit, &c.

The finding of the best markets and the quickest routes thereto is another instance of Mr. Lawry's active business capacity and shrewdness. Having ascertained that the northern markets were generally in advance of the London ones towards the middle and end of the season, he consigned fruit there; but, not being satisfied with the prices first obtained, made inquiries, and found that his consignments arrived too late for securing the top figures. This was especially the case at Edinburgh. He then entered into negotiation with the various railway companies, and is now able to get his fruit into the northern markets as early as consignments from Covent Garden and other districts. Fruit now gathered in Cornwall before 6 A.M. one morning is sold in Edinburgh at 6 A.M. the next day, and at other less distant markets at a still earlier hour.

Mr. Lawry's success in the past has naturally secured for him many followers. Much land in the neighbourhood is now devoted to fruit growing. Every cottage garden, or allotment, has its bed of strawberries, the produce of which is sold in the various local markets or by retail to the passengers on the steamboats which ply up and down the river in the holiday season. Occasionally some of the fruit is sold with Mr. Lawry's to distant markets, and the proceeds are divided in equal rates, for Mr. Lawry is an ardent advocate of co-operation, and is a share-

holder and customer to a considerable extent of the Western Counties Association already referred to.

Four or five years ago, about 30 acres of coppice wood, called Brent Wood, was cleared, and converted into strawberry and fruit gardens. It was let off in plots of the proverbial three acres extent, and from being worth 8s. to 10s. an acre as coppice is now let at 5*l.* to 6*l.* an acre on ten years' leases. The landlord sold the coppice, but the tenants, who in some cases were labourers, cleared the land, then limed it at the rate of 50 bushels per acre, took a crop of potatoes, and afterwards planted strawberries. The landlord has provided some fruit trees, and has the right to purchase any found by the tenants, who have to maintain trees and plants when once attached to the soil. Twenty-five 2-horse cartloads of dung have to be applied to each plot yearly, for which there is a wharf on the river side about three-quarters of a mile away. The labour of clearing, which has been done mainly by the tenants themselves, and entirely at their expense, is estimated at 20*l.* per acre, and the annual weeding is put at 5*l.* per acre. In the first year of produce, as much as 300*l.* has been received for sales from some of the plots; but out of this must be deducted 50*l.* to 70*l.* for cultivation, picking, and something for railway and land carriage. Sometimes 100, and occasionally 200, persons may be seen gathering fruit on this reclaimed land. The first crops, however, have been in excess of all succeeding ones.

It may be interesting to mention as an instance of fair and considerate dealings between landlord and tenant, that in Mr. Lawry's lease are covenants for liberal compensation for bones, lime, and feeding stuffs, and for land brought under fruit cultivation. Twenty pounds an acre is taken as the basis of compensation for this latter, extending over a graduated period of five years. In addition, Lord Mount Edgcumbe has allowed Mr. Lawry, in common with all his agricultural tenants, 10 per cent. reduction of rent for the last four or five years.

The writer can imagine advocates of fruit farms and small holdings pointing to this one as an instance of the success attending the schemes they advocate. But this is quite an exceptional case. The circumstances of the locality specially favour the existing usage, and Mr. Lawry himself is "one in a thousand." Few are the men in his rank of life with the same enterprising abilities, persevering energies, and shrewd intelligence, and rarer still are the occasions when such men confine their attention to a few acres of land. Other occupations provide more scope and greater profits.

CLASS III.—SECOND PRIZE FARM.

Occupied by Mr. C. Bath, Gear Farm, Camborne.

This farm is situate just outside the small town of Camborne, the centre of one of the chief mining districts of Cornwall. 46A. 1R. 13P. are in grass, and the remaining 22A. 1R. 19P. are arable. The tenancy is under a lease for 21 years, of which two-thirds have expired. In this Mr. Bath succeeded his father, who had been on the farm for 46 years. Rent, tithe, and rates amount to about 45s. per acre.

The house is a substantial and roomy one, of comparatively recent erection, and is kept in capital order and condition. The dairy is well planned and ventilated, and is as clean and neat as it can possibly be. The other buildings are well built, and contain all the accommodation needed for the farm. Water is laid on to every pasture field from the town supply, which passes along the road bounding one side of the farm. For this the tenant pays 4l. 10s. a year, and considers the advantages are quite worth it.

One portion of the farm is stiff clay, and lies so low that there is no fall for the drainage, except by crossing the adjoining land for some distance. This is doubtless the reason why two or three of the fields are undrained. One of these is named Park Starver, and is not far from deserving its name, though if it were drained and treated as Mr. Bath treats the rest of his land it would soon redeem its character.

Around the homestead the soil is comparatively light, and responds gratefully to the liberal treatment which it receives. The pastures are fairly good and show much clover, rye-grass, and rib-grass; but Yorkshire fog is too prevalent in some of the leas, and would seem to have been imported in the seed mixtures, as it is somewhat rare in the older pastures. Some of the grass fields are mown in alternate years, and are always manured before mowing. Indeed, the land is in such good heart, that last year, upon the advice of the landlord's steward, one field of seeds was mown twice, so full was the second growth. This second cutting was got late, and, to prevent overheating, alternate layers of the hay and rakings of the corn fields were placed in the stack. In cases such as this the making of silage would have been much the best plan of securing the crop.

Only nine acres of corn, chiefly "dredge" for home consumption, are grown. The root crop this year extends to 6½ acres, and is chiefly in turnips; 1¼ acres are mangel, whilst

cabbages and potatoes, which are both to be sold off, cover $\frac{3}{4}$ acre in all.

The land generally is very clean, and in capital condition. Mr. Bath buys about 15*l.* worth of artificial manures yearly, and consumes most of his own corn. He has a great liking for compost heaps, and in January last had as many as seven ready to go on to a like number of fields. They are composed of soil dug from the foot of the fences, road-scrapings, and dung.

A small herd of cows (half-bred Guernsey and Shorthorn, and excellent milkers) is kept, and their produce reared. Other cows, and heifers, and a bull or two to keep them company, are bought in the spring and fed off. Some go early in the autumn without cake. Others are kept till Christmas and get an allowance of meal, &c. In January the total head numbered 36. Of these, seven cows, one steer, and two bulls, had gone to the butcher before June, and their place was supplied by 10 cows (Irish), and one bull bought in May last. Mr. Bath selects his feeding animals to suit the local markets, where the prices for the different qualities of meat rule much more evenly than those offered by the generality of butchers elsewhere. Last Christmas his fat bulls and cows made 64*s.* per cwt., whilst for the best of heifers he could realise only a trifle above 7*d.* per lb. The demand for the best qualities is not equal to that for the coarser ones.

From 25 to 30 ewes are bought each autumn, and put to a Shropshire ram. The ewes were good big sheep, and 27 of them produced 37 lambs. The latter were the most forward seen on any of the farms, except Mr. Franklin's. Indeed, four had gone at Easter at 40*s.* apiece. Last year the prices ranged from 35*s.* to 50*s.* each between May and July. The 24 ewes that had been bought for 1889 went out, with their produce, for 74*l.* over prime cost. Five pigs are kept, but Mr. Bath does not care about them, because the miners keep one apiece. Some poultry are kept, and young chickens are bought, reared, and fed. Five horses do the work of the farm, and in addition help to augment the profits by carting tin, &c. for the neighbouring mines. As much as 200*l.* per annum has thus been added to the credit side of the farm account.

Much attention is paid to dairy produce. Mr. Bath was himself at one time a butter-maker and has competed at local Shows. But Mrs. Bath now does the work, and under his tuition has become so good a hand at it that this year she won two first prizes and a very high commendation in local contests.

Mr. Bath is a lover of neatness. His implements and tools are stored away, each in its proper place. His gateways

and fences also were in the neatest of order. Some of the former had been only recently renewed, and the gates had received their triennial coat of paint.

The general state of the farm is a very creditable example of good management on the part of a small holder.

CLASS III.—THIRD PRIZE FARM.

Occupied by Mr. E. F. Damerell, Colwell Farm, Egg Buckland, Crown Hill, Plymouth.

This is a small farm of 84 acres (49½ arable, 32 grass, and remainder homestead, &c.), situate on the south-western confines of the Dartmoor Range, and about six miles north-east of Plymouth. About 25 acres were formerly part of the Buckland Common, which was inclosed 25 years ago. The tenancy is under lease for seven years which expires in 1892.

The house is small but well built, and the farm buildings are fairly substantial erections. They are not quite extensive enough to accommodate all the stock which Mr. Damerell has on the farm during winter, but in this respect the position is one which is common to most small holdings. The provision of sufficient buildings at a cost upon which the tenant can afford to pay interest, is one of the difficulties which was frequently impressed upon the House of Commons' Committee on Small Holdings.

Of the arable land, 16 acres are in corn, 12½ in roots, and the remainder in rotation grasses. A dairy herd of 17 cows is kept, chiefly crossbreeds. The morning's milk is sent into Plymouth, whilst the evening's supply is set and scalded next morning. Some of the calves are reared until matured for either the herd or the butcher.

About 45 ewes, improved Dartmoors, are bought in the autumn; those bought in 1888 cost 40s., and those in 1889 46s. each. An early crop of lambs is taken and the ewes are fed so as to go off fat shortly after shearing. In June last 22 of the 1890 lambs had been sold at 35s. and 36s. apiece, and some ewes at 37. The sheep seen are described in the Judges' notes as a very useful lot, and were estimated to clip 10 lb. of wool each. Seven horses are kept, but some of them are mainly employed in carting stones for the highways and main roads in the locality. The receipts for this extraneous work last year were just above 2007. At the time of the June visit, the horses were drawing implements to the Show-yard at Plymouth. A fairly liberal expenditure is made in cake and other feeding

stuffs and in lime and artificial manures, and some town dung is brought back from Plymouth when the horses and carts have occasion to go there. The labour bill is a somewhat heavy one, but this is accounted for by some of the men being engaged for the stone-carting.

CONCLUSION.

The writer cannot conclude without drawing attention to one of the lessons which has been strongly impressed upon him during his visits to the district of the competition, viz. that the old proverb about the early bird getting the worm (if he is up first) might be rendered "the early grower gets most profit." As the reader, if he has had patience to wade through the foregoing details, must have seen, there are several instances given in support of such rendering. One competitor gets the highest price for his green forage because he has it ready and in the market *earlier* than his neighbours; another gets the best return for his fruit because it is the *earliest* in the market; whilst the profits from the potato and flower crops in Scilly and South Cornwall are entirely dependent upon their *early* maturity and *being first in the market*.

It perhaps goes without saying that the Judges were everywhere received with the greatest cordialness and hospitality, which they heartily appreciated. What visitor on errands such as theirs ever failed to meet with free welcome? And surely none could fail to appreciate the tender mutton, juicy beef, piquant cider, clotted cream, and delicate junket which are so hospitably offered to all visitors in Devonshire and Cornwall. The several competitors met the Judges with the kindest consideration, and offered every facility for a thorough insight into their respective methods of management. For all this the Judges desire to express to them their best thanks, and to assure them that they will retain for many years the most pleasant recollections of the kind and friendly reception they met with.

F. PUNCHARD.

Official Reports.

REPORT OF THE COUNCIL

TO THE

HALF-YEARLY GENERAL MEETING OF GOVERNORS AND MEMBERS,

HELD IN THE

HALL OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY,

At 20 Hanover Square, W.,

ON THURSDAY, DECEMBER 11, 1890.

EARL CATHCART (Trustee) in the Chair.

THE Council have to report that the List of Governors and Members has undergone the following changes during the half-year which has elapsed since the Anniversary General Meeting on May 22 last :— 3 new Governors and 219 Members have joined the Society, 5 have been reinstated under By-Law 12, and 3 Members have qualified as Governors ; whilst the deaths of 1 Honorary Member, 6 Life-Governors, 79 Life-Members, and 83 Annual Members have been reported. Twelve Members have been struck off the books under By-Law 10, owing to absence of addresses ; 79 under By-Law 11, for arrears of subscriptions ; and 30 have resigned.

2. The Council regret to announce that no less than five of the original Members of the Society have died since their election as " Foundation Life-Governors " in March last—viz., Sir John Ogilvy, Bart., of Baldovan House, Dundee ; Mr. William Aldam, of Frickley Hall, Doncaster ; Mr. Joseph Druce, of Eynsham, Oxford (a Member of the Council from 1860 to 1888) ; Mr. F. H. Dickinson, of King's Weston, Somerton ; and Mr. Isaac Pearson Evans, of Griff, Nuneaton. Amongst other Governors and Members whose loss by death the Society has had to deplore during the past half-year are the Marquis of Normanby, the Earl of Rosslyn, Lord Deramore, Lord Magheramorne, Lord Tollemache (a Member since 1841), Sir Richard Wallace, Bart., Sir Tenman Mosley, Bart. (a Member since 1841), Sir Edwin Chadwick, K.C.B. (a Member since 1842), Mr. Robert Leeds (a Member of the Council from 1869 to 1889), and

Mr. W. Beckett, M.P., who was one of the chief promoters of the Society's visit to Doncaster next year. The Council have also received a notification of the death of Mr. Edward Tesdorpf, of Ourupgaard, Falster, Denmark, who was elected an Honorary Member of the Society in 1877.

3. The Council have elected the following gentlemen as Honorary Members of the Society, in recognition of their distinguished services to agriculture :

Baron ARTHUR VON HOHENBRUCK, of the Imperial and Royal Ministry of Agriculture, Vienna.

Chev. EMANUEL VON PROSKOWETZ, sen. (of Kwassitz), of the Imperial and Royal Agricultural Society of Moravia and Silesia.

Mons. HENRY LEVEQUE DE VILMORIN, of Paris.

4. These and other changes bring the total number of Governors and Members now on the Register to 10,924, divided as follows :

116 Life-Governors,
64 Annual Governors,
3,799 Life-Members,
6,926 Annual Members,
19 Honorary Members ;

or a net decrease of 60 Members during the half-year. This is not really a diminution of the effective strength, as the previous statement included the names of a considerable number of deceased Life-Members, whose deaths were not reported to the Society until forms of receipt for the Journal were issued in the spring.

5. The Council deem it necessary, however, to remind the Members that the maintenance of the Society's operations upon their present scale depends upon a continued flow of new subscribers. At least 500 new Members need to be elected every year to take the place of those who die or retire. The Council desire, therefore, particularly to invite each Member to interest himself in obtaining new subscribers to the Society, and to suggest the names of any farmers, or others interested in Agriculture, in his district or of his acquaintance, who would be likely to become Members. The Secretary will, upon receipt of instructions, either write direct to the gentlemen named, or will forward a supply of application forms to the nominating Member. A form of nomination is printed in each number of the Journal.

6. The Council have the gratification of announcing that H.R.H. Prince Christian of Schleswig-Holstein, K.G., has consented to be nominated as a Vice-President of the Society. The two vacancies on the Council referred to in the last Report were filled up at the General Meeting on May 22, by the election of Lord Brougham and Vaux, of Brougham Hall, Penrith, and Mr. Joseph Beach, of the Hattons, Wolverhampton. Two other vacancies, which have recently

arisen by the resignation of the Marquis of Tavistock and by the appointment of the Earl of Jersey as Governor-General of New South Wales, will come in due course under the consideration of the Council.

7. The Country Meeting at Plymouth in June last was favoured by fine weather, and the Society received from the local authorities and the inhabitants of the Three Towns generally a very cordial welcome. The show of live stock (particularly of the local breeds of cattle and sheep) was universally admitted to be a very good and representative one; and the Trials of Light Portable Motors, Grist Mills and Disintegrators lent particular interest to the Implement Department. At the request of the Mayor (Mr. H. J. Waring), to whom the warmest thanks of the Society are due for his indefatigable efforts to promote the success of the Meeting, the experiment was tried for the first time of having only one half-crown day, and making the charge for admission on the third day of the Meeting (Wednesday) one shilling only. The results were not such as to warrant a continuance of the plan, for the two shilling days on Wednesday and Thursday caused the attendance on the final day (Friday) to drop to 14,026, which is the lowest figure of the last ten years. The total attendance of paying visitors at the Meeting was 97,141, as compared with 155,707 at Windsor in 1889, 147,927 at Nottingham in 1888, and 127,372 at Newcastle in 1887.

8. Opportunity has been taken by the Society's Auditors, when checking the accounts for the half-year ended June 30 last, to examine and pass the balance-sheet for the Plymouth Meeting. The final result is an excess of expenditure over receipts of 2,197.7s. 1d., which will fall to be defrayed out of the Society's general funds. A comparison of the various items on both sides of the account with those of the Nottingham Show in 1888, when the receipts exceeded the expenditure by 4,229%, shows that whilst the expenses of administration were about the same on both occasions, the Society received this year 1,000% less for entry-fees and 4,000% less for receipts at the Show itself, and paid 1,000% more for the construction of the Show-yard, owing chiefly to the rise in the price of timber.

9. The Council have decided that the Doncaster Meeting shall commence on Monday, June 22, 1891, and close on the following Friday evening. The Implement Yard and the Working Dairy will be open to Members of the Society and the public on the previous Saturday, June 20. The last day for making entries in the Implement Department will be Wednesday, April 1; but post-entries, of Agricultural Implements only, will be received up to Monday, April 6. For Stock, Poultry, and Produce, the entries will close on Friday, May 1, with post-entries at double fees up to Tuesday, May 12. With the view of keeping the number of entries at the Meetings within manageable limits, the Council have resolved that no exhibitor shall in future be allowed to make more than three entries in any one class.

10. The following Prizes for Implements and Dairy Appliances will be offered in connection with the Doncaster Meeting :—

Class	First Prize	Second Prize	Third Prize
1. Combined Portable Threshing and Finishing Machine to be worked by steam, and adapted to the preparation of corn for market	£100	£50	£25
2. Cream-separator (Power Machine)	£30	£20	—
3. Cream-separator (Hand Machine)	£20	£10	—
4. Mechanical Milking-machine	£20	£10	—

As announced in the Report to the Anniversary Meeting in May, the entries for the Prizes for Threshing-machines closed on August 1 last, up to which date nine entries had been received. For the other Classes, 2, 3, and 4, the entries will close on April 1, 1891.

11. The Society will offer at Doncaster Prizes for Hunters, Hackneys, Ponies, Shire, Clydesdale, and Suffolk Horses for breeding purposes. The prizes customarily offered by the Local Committee for breeds of animals of special interest to the district will on this occasion be given exclusively for Horses, a sum of 86*l.* having been voted from the funds of the Local Committee for this purpose. The Prizes thus offered include 7 classes for Hunter Mares, Geldings, and Colts ; 7 classes for Coach Horses ; 6 classes for Hackneys ; 2 classes for Pony Mares or Geldings ; 2 classes for Harness Horses and Ponies ; and 2 classes for Agricultural Geldings of any breed. The Council have decided to insert in the Prize Sheet a new Regulation that no Stallion shall be awarded a prize until a veterinary examination shall have pronounced such Stallion to be free from hereditary disease.

12. In the Cattle Classes, Prizes will be offered for Shorthorns, Herefords, Devons, Sussex, Welsh, Red-Polled, Aberdeen Angus, Galloways, Ayrshires, Jerseys, Guernseys, Kerrys, and Dexter Kerrys, and for Dairy Cattle giving the greatest quantity of milk containing not less than 12 per cent. of solids and 3 per cent. of butter-fat.

13. In view of the large increase which has taken place of late years in the number of breeds which have possessed Stud or Herd Books for upwards of seven years, and thus come within the Society's rule that any animal exhibited of these breeds must be entered or be eligible to be entered in the appropriate Stud or Herd Book, the Council have passed a regulation requiring proof of eligibility of animals entered as eligible for the Stud or Herd Book to be furnished to the Secretary at the time of making the entry.

14. Prizes will be given for Leicester, Cotswold, Lincoln, Oxford Down, Shropshire, Southdown, Hampshire Down, Suffolk, Wensleydale, Border Leicester, Cheviot, Black-faced Mountain, Lonk, and Herdwick Sheep ; for Large White, Middle White, Small White, Berkshire, Black, and Tamworth Pigs ; and for useful descriptions of Poultry, including Table Fowls and Table Ducks.

15. For Farm and Dairy Produce, Prizes will be given in six Classes for Cheese of 1891 make, in two classes for Soft Cheese, and in three Classes for Butter. Prizes will also be given for Cider and Perry, and for Jams and Preserved Fruits made in 1890. The British Bee-Keepers' Association will continue their Prizes for Hives, Honey, and Bee Appliances.

16. The Butter-making Competitions, which have been an interesting feature of the Annual Shows for several years past, will be continued at Doncaster. Four classes have been arranged for, five Prizes being offered in each class. There will also be a competition of Shoeing Smiths practising in the county of York. The competition will be in two classes, Hunters and Agricultural Horses, and five Prizes will be offered in each class. The Worshipful Company of Farriers have generously offered, as before, to provide the First Prize in each of these two classes, and to bestow the freedom of their Guild upon the two first-prize winners.

17. Prizes amounting to 300*l.* have been offered in three classes by the Doncaster Local Committee for the best-managed Farms in the county of York. The number of farms entered for competition is eleven, and the Judges will start on their first tour of inspection early in January.

18. The Council have agreed to continue for another year the grant of three Premiums of 200*l.* each for Thoroughbred Stallions serving Mares in the Society's District E, which consists of the county of York. The Doncaster Local Committee have promised to bestow a Gold Medal upon the owners of each of the three Stallions winning the Society's Premiums, which will be competed for at the same time, and under the same conditions, as the twenty-two Queen's Premiums offered by the Royal Commission on Horse-breeding.

19. The Council have received invitations from the Town Councils of Warwick and Gloucester to hold the Society's Country Meeting of 1892 in those towns. The customary Committee of Inspection has been appointed to report on the site and other accommodation offered at each place, and a final decision as to the place of meeting in 1892 will be made by the Council in February next.

20. As on the occasion of the last great International Agricultural Congress, which took place in Paris in 1878, the Society was officially represented by its then President and other delegates, the Council deemed it expedient that the Society should also be represented at the Congress which took place in Vienna in September last, under the patronage of the Emperor of Austria. It will be gratifying to the Members to know that the Society's participation in this Congress was warmly welcomed by the Executive Committee, and that all possible facilities were everywhere given to the Secretary, who represented the Society, for obtaining information as to

the agricultural administration and practice of the Austro-Hungarian Monarchy.

21. The Council have received an invitation from the Organising Committee of the International Congress of Hygiene and Demography, which will be held in London next August, under the presidency of H.R.H. the Prince of Wales, to appoint delegates representing the Society upon the General Committee of the Congress. As the Congress proposes to discuss the important subject of the relation of diseases of the lower animals to those of man, the Council have accepted this invitation, and have appointed the President and the Chairman of the Veterinary Committee to act as the Society's representatives.

22. The scheme for the examination and registration of farriers or shoeing-smiths—to which reference was made in the last Report—was publicly inaugurated at a meeting held at the Mansion House on June 2; and, a sufficient guarantee fund having been raised to start the scheme on a proper financial basis, the Council have given their formal adhesion to it, and have nominated as their representatives on the Registration Committee the President of the Society for the time being, the Chairman of the Veterinary Committee for the time being, Sir Jacob Wilson, Mr. Charles Clay, Mr. Walter Gilbey, and the Secretary. Up to the 31st instant, it is proposed to admit all shoeing-smiths to the Register without examination, upon sufficient evidence of the skill of the applicant being produced; but after the commencement of 1891, all candidates for admission to the Register will be required to undergo such examination as the Registration Committee may appoint. The Committee have promised to admit to the Register, free of charge, all the winners of prizes, and all commended competitors, at the Society's Horse-shoeing Competition to take place in the Doncaster Show-yard next June.

23. In their last Report, the Council referred with satisfaction to the fact that a Bill for placing the slaughter of animals affected with pleuro-pneumonia under Government control, and for the payment of compensation at the cost of the Imperial Exchequer, had been introduced into Parliament by the Government. Since then the Bill has received the Royal assent, and is now (since September 1) in force throughout Great Britain. The Council readily undertook at the request of the Board of Agriculture, to use the Society's influence in securing for the Board the earliest intimation of outbreaks of the disease, and with that view issued a circular letter to all the Members, impressing upon them the great importance of prompt declaration of disease whenever it might appear, and of a loyal submission to the orders which may from time to time be issued by the Board of Agriculture. The Act has, since the appointed date of its commencement, been administered with firmness and stringency; and, according to the latest information, the total number of cattle slaughtered under its provisions has been about five thousand.

24. The Department of Research and Comparative Pathology, which has been established at the Royal Veterinary College under a grant from the Society, is now in working order. In the Laboratory, during the past three months, the undernoted subjects have received attention, and most of them are yet under investigation, viz.:—Milk from tuberculous cows; tumours; suspected actinomycosis; cystic tumours; tuberculosis in the horse; tuberculosis in cattle; pyæmic abscesses in cow's liver; pleuro-pneumonia, contagious and septic; anthrax in cows; foot-rot in sheep; and a form of tuberculosis in the kangaroo.

25. The Council have appointed as Provincial Veterinary Surgeons of the Society, Mr. Owen Thomas, of Ty-coch, Llanerchymedd, for the county of Anglesey; and Mr. C. Hedworth Gollledge, of Sherborne, for the county of Dorset.

26. In the six months ending November 30, over 700 samples have been sent by Members for analysis at the Society's Laboratory. Of these over 200 consisted of samples of linseed-cake. The number of cases in which linseed-cake, purchased without a guarantee of purity, has been found to be extremely impure or adulterated fully confirms the repeated cautions of the Chemical Committee on this subject, and shows the necessity of Members of the Society acting on the advice embodied in the form of "Contract Note" issued by the Council in the early part of the year. The number of samples of decorticated cotton-cake sent for analysis shows a very considerable diminution. This is without doubt due to the very inferior quality and excessive hardness of the great bulk of the cake imported into this country. The number of manures sent for analysis again shows a considerable falling-off. Manures sold with a distinct guarantee have, as a general rule, proved of good quality. Some cases, however, of adulterated bones and inferior dissolved bones have been dealt with in the Quarterly Reports of the Chemical Committee. A few instances of superphosphate containing low percentages of soluble phosphate have also occurred. A very large number of samples of drinking-water have been examined, and in many instances reported upon as unfit for use.

27. In addition to the analyses of samples sent by Members of the Society, eight analyses of manures and feeding-stuffs have been made in connection with the Woburn Experimental Farm; and over 800 determinations of nitrogen in samples of soil from the permanent wheat and barley plots have been made. The crops of wheat and barley from the permanent and rotation plots of the Experimental Farm have been threshed and weighed, and the results will be published in the Journal. On the rotation plots the whole of the crop of swedes was unfortunately destroyed by "finger-and-toe." Feeding experiments on one hundred sheep and eighteen bullocks have just been started.

28. Three hundred and eighty applications have been made to the Consulting Botanist during the year, principally referring to

seeds for permanent pasture. The quality of the seeds examined continues to be of the same high quality as was reached last year. No case of intentional adulteration was met with, if a case of ryegrass is excepted, which contained 66 per cent. of the seed of brome-grass. Several cases of injuries to crop-plants from the attack of fungal and other parasites have been investigated. The disease which has done serious injury to larch plantations has been the subject of special inquiry, and an account of it is being prepared for publication. An inspection has been made of a large number of the famous ancient pastures of England, which will form the subject of a paper in the next number of the Journal (see page 751).

29. During the past half-year the work of the Consulting Entomologist's Department has steadily progressed, almost daily applications being received for identifications of insects or for information concerning means for their prevention. Amongst other kinds of uncommon insect pests, respecting which applications have been received, may be mentioned the appearance of the American Clover-seed Midge, the Stem Eelworm as an attack seriously stunting the growth of bean-plants, and attacks of two other kinds of Eelworm which have been injurious by causing extremely deformed and totally barren growth in strawberry-plants. The Apple Chermes, or Apple-sucker, did mischief (little previously observed) in the spring. The Hessian Fly was present in many localities, but, so far as was reported, did very little mischief. The treatment for prevention and also for direct clearing off of Orchard Caterpillars proved successful, in the cases which have been reported, where it was carried on according to directions. The attention to Warble attack has also been very satisfactory in amount and effect, but plain information is still much needed amongst the workers who personally attend to the cattle. Miss Ormerod reports that "there is certainly a very satisfactory increase in amount of public information as to practicable measures for lessening amount of losses by insect agency, and that applications constantly increase for plain and sound information, and as to where serviceable works can be procured bearing on farm insect prevention."

30. As a result of the Examination for the Society's Senior Prizes and Certificates, which took place on May 13 to 17 last, eleven of the sixteen candidates satisfied the examiners; and the following competitors, placed in order of merit, gained First-class Certificates, and thus became Life Members of the Society; the first four being entitled, in addition, to the prizes stated below:—

1. FRANCIS REGINALD ARMYTAGE, 4 Pump Court, Temple, E.C. *First Prize of 25l.*
2. RICHARD WILLIAM HAYDON, Great Coombshead, North Molton, Devon. *Second Prize of 15l.*
3. HENRY CRABTREE, 30 Lutton Place, Edinburgh. *Third Prize of 10l.*
4. ALFRED HENRY INMAN, 9 Queensferry Street, Edinburgh. *Fourth Prize of 5l.*
5. JOHN JAMES JEFFRAY, Blackaddie, Sanquhar, N.B.
6. RICHARD HENDERSON, Portland Estates Office, Kilmarnock, N.B.

The following candidates, having passed in Agriculture and

in three of the other four compulsory subjects, were awarded Second-class Certificates :—

7. EDWARD DOUGLAS MALCOLMSON HAMILTON, Magheraboy, Portrush, Co. Antrim.
8. JOHN ARTHUR LLEWELLYN BEASLEY, Aylestone, Leicester.
9. GEORGE PELHAM THOMAS, Hensworth, Wakefield.
10. JAMES GUNTER, Estate Office, Glasbury.
11. GEORGE SHARMAN MITCHELL, Cannon Street, Belgrave, Leicester.

The next Senior Examination has been fixed for May 12 to 16, 1891.

31. The Annual Examination for the Society's ten Junior Scholarships of 20*l.* each took place on November 11 and 12, when forty candidates from fourteen schools competed. Of these candidates, sixteen passed in all four subjects (Agriculture, Chemistry, Mechanics, and Land-Surveying), and obtained the number of marks necessary to qualify them for the Society's Scholarships and Certificates, in the event of their complying, during the forthcoming year, with the conditions of the Examination. Two other boys passed in each of the four subjects, but, not having obtained the minimum aggregate of marks, are ineligible for Certificates. Of the twenty-two other unsuccessful candidates, ten failed in one subject, seven in two subjects, three in three subjects, and one in all four subjects. There were nine failures in Agriculture, nine in Chemistry, eleven in Mechanics, and nine in Land-Surveying. Of the sixteen successful candidates, the first ten in the following list will receive Scholarships upon complying with the Society's regulations, and the remainder will receive Certificates :—

1. JOSEPH LISTER, Aspatria Agricultural College.
2. WILLIAM WILSON, Aspatria Agricultural College.
3. (eq.) (DAVID ALEXANDER, Maybole Public School, N.B.)
WILLIAM AUSTIN ROBINSON, Sedgebrook School, nr. Grantham.
EDWARD HOWARD SMART, Portsmouth Grammar School.
6. JOHN DANIEL, Ashburton Grammar School.
7. WILLIAM GRICE MASON, Aspatria Agricultural College.
8. WILLIAM HUTCHESON, Aspatria Agricultural College.
9. WILLIAM AVERY GILLSON, Norfolk County School.
10. CHARLES ARNISON, Aspatria Agricultural College.
11. ROBERT GEORGE HEAMAN, Devon County School.
12. ERNEST EDGECOMBE, Ashburton Grammar School.
13. CHARLES HUGH MILLS, Ashburton Grammar School.
14. ROBERT RENNIE, Maybole Public School.
15. HENRY JOHNSON, Swanley Horticultural College.
16. JOSEPH HARKER NEWMAN, Surrey County School.

32. The Council are gratified to find that the subject of Technical Education in Agriculture has been taken up by the Board of Agriculture, and there is no doubt that the action of that Board has done very much to stimulate interest in this subject, both amongst agriculturists themselves and amongst other bodies which are considering the general question of technical education. The allocation by Parliament to the County Councils of a portion of the proceeds of the license duties, with an intimation that these funds,

for the present year at least, may be appropriated in aid of technical education, has recently brought this subject very much to the front ; and as it may reasonably be anticipated that in the agricultural counties some of this money will be devoted to the promotion of technical education in agriculture, the Council have felt it incumbent upon them to give careful consideration to the directions and methods in which such a grant could be best applied. The Council have already debated this question on two occasions since the last General Meeting ; but as the subject is one of some complexity and much difficulty, they have postponed any final recommendation in the matter until their meeting to be held in February next.

33. The Council have been invited by the Charity Commissioners to give their opinion upon several schemes which are intended to provide agricultural sides at schools already existing ; and they have been asked to nominate representative governors, both upon these foundations and upon several others for secondary schools throughout the country.

34. The Council have received a letter from the Board of Agriculture, inviting the opinion of the Society as to the establishment of some more uniform system than exists at present of examining pupils to whom Dairy Instruction is given, and asking if the Society would be willing to make a selection from amongst its Members of Examiners qualified by their special acquaintance with this branch of Agriculture, in order to secure for the projected examining body the highest possible qualifications. The Council have readily promised their co-operation to the Board of Agriculture in the establishment of such an examining body, which the Council think the Members generally will agree with them in considering to be very desirable and highly important.

35. Three parts of the Society's new Quarterly Journal have now been published, and the fourth part, completing Vol. 1 of the Third Series, will be issued on the 31st instant. In compliance with a desire expressed by a number of Members for the uniform binding of their volumes of the Journal, the Council have selected a superior green cloth cover, with gilt lettering at the back and the Society's device at the side, and have arranged with Messrs. Spottiswoode & Co. for the binding for Members of each year's numbers at the price of Two Shillings per volume, to include packing in boards and return postage. The Council have arranged with the same firm to bind back volumes of the First and Second Series at the same price ; and with the view of facilitating the completion of sets which Members may possess, the Council have resolved to reduce the price to Members of the First and Second Series to 3s. 6d. per part, the publishing price of the new Quarterly Journal.

By Order of the Council,

ERNEST CLARKE,

Secretary.

ANNUAL REPORT FOR 1890 OF THE CONSULTING BOTANIST.

DURING the year 380 applications have been received from members of the Society. These refer principally to seeds for laying down pasture. The samples continue to present the same high standard of purity and germination. Rye-grass, not many years ago, was almost universally used as an adulterant of the larger fescues; this year it was the only grass submitted to me that had been deliberately adulterated, the sample consisting of only 34 per cent. of rye-grass, and 66 per cent. of brome-grass. The clover seeds are not yet free from dodder; 12 per cent. of the alsike seeds and 9 per cent. of those of perennial red clover contained seeds of this injurious parasite. The yarrow, with a single exception, possessed a high degree of purity and germination.

It is to be regretted that so little is known by many practical men of the properties of the different plants which compose a pasture. One correspondent forwarded some specimens of rough-stalked meadow grass (*Poa trivialis*, Linn.), which was very common in his district, and reputed to be disliked by stock. Another sent some plants of a "rough coarse grass" which abounded in his meadows, and which the stock would not eat. He was anxious to get rid of it, but when he heard that it was cocksfoot he was glad that he had it in his pasture. A farmer informed me that this coarse grass was a kind of twitch, and a most objectionable element in his pasture. A member sent me specimens of yarrow with the complaint that it did not appear to be eaten by cattle, informing me that in a neighbour's field, where horses only were kept, it became a great pest, but when sheep and cattle were put in it disappeared entirely. This kind of observation, which is too common, is hopelessly misleading. The horses did not like the yarrow, and so left it, and it became "a pest"; while the sheep and cattle liked it, and ate it down so that it "disappeared"—not that there was a single plant less than when the horses were in the field, but that they were eaten so close to the ground that they could not be detected without careful observation.

From the frequent mistakes made, and from the want of knowledge in regard to the useful and useless plants in pastures, I am sure that some effort, by accurate diagrams or otherwise, to meet this defect would be of great service to agriculture.

Many samples of weeds have been submitted for identification, and advice as to getting rid of them. Chickweed grew to such an extent in a rotation crop of clover and rye-grass on a sandy loam as to overpower the fodder-plants, and reduce the quantity of food to a half. Chickweed is an annual plant, producing a large quantity of small seeds, which are well protected against the weather by a firm covering, and are ready to germinate when the temperature

and other conditions are favourable. If hand-pulling is not possible, the chickweed should be cut when in flower to prevent seeding.

Several inquiries have been made as to devil's-bit scabious, not that it had produced any injury to stock, but it had so greatly increased as to displace the useful plants of the pasture. Being a perennial plant with a short thick root, giving off numerous branching fibres, it cannot be eradicated except by spudding or careful hand-pulling. The greater knapweed, which has also been complained of, must be similarly treated.

Bitter-sweet caused injury to several cows in a field where it was abundant in the surrounding hedge. It is an active poison, and should not be allowed to grow where cattle feed. It must be dug out, but, as the plant rarely occurs in any abundance, this is not a serious work. The water figwort, though it cannot be said to be a dangerous plant, may nevertheless produce some irritation in the digestive canal, and should consequently be eradicated. Another weed, often found associated with the water figwort, has a very suspicious appearance, and is often credited with injury, but without just cause. I refer to marshwort, an umbelliferous plant with a straggling stem, freely rooting at the joints, and producing its numerous small white flowers on short stalks at the joints opposite the leaves. This plant is often gathered with watercress, and is eaten with impunity. It is very common along the margin of ditches and in marshes. Queen of the meadow is a common weed in meadows, which is freely eaten when its leaves are young without any injury.

Complaints have been made of the presence of the greater burnet in clover. This is an impurity occasionally found in clover seed. There is no difficulty in separating it because of its difference in size. It is sometimes eaten by stock, but it is not a favourite food, and clover seed mixed with it should be rejected.

The large Siberian melilot or Bokhara clover has appeared in several places among the lucern. This great melilot was introduced some years ago as a useful fodder-plant producing a large amount of food, but it was found to be too watery when young, and too woody when old, and its cultivation has been discontinued.

Serious cases of injury to crops by the attacks of parasites have been brought under my notice. In several districts dodder has been very destructive to the clover. The parasite has no doubt in each case been introduced with the seed. The sale of clover with dodder is inexcusable, because, from the different sizes of the two seeds, a sieve with proper meshes will easily separate them. No clover seed, at least no alsike or red clover, should be bought without a guarantee that it is free from dodder, and then compensation could be obtained if unclean seed were supplied. When the dodder appears it should be completely removed and burned, and a space of at least a yard all round the affected plants should be cut clean down and removed; if this is not done some outlying fragments of the dodder will re-establish themselves and spread the injury. Complaints have also been made of broom rape, another parasite, the seed of which is introduced with the clover seeds. It is much more

difficult to eradicate this parasite, as it attaches itself to the roots of clover. If the plants are not dug up, they should be prevented from seeding, especially if the clover is intended for more than one year's lay.

Besides samples of rust and mildew, which unhappily do their evil work on the wheat crop more or less every year, I have had cases of straw blight in barley brought to my notice. The fungus in this disease attacks the straw just above the root, and so destroys the tissues as to prevent the ascent of the water from the roots, and to arrest the active life of the plant.

Several fields of swedes in Norfolk were attacked by a fungus (*Peronospora parasitica*) nearly related to that which produces the potato disease. The attack begins on the leaves, and the roots (*mycelium*) of the fungus pass down the leaf-stalks to the bulb, where they destroy the flesh, and produce putrefactive decay. The turnips may somewhat recover, if the disease is not very severe, by the development of several buds around the injured crown. The diseased turnips should be destroyed by burning them. If allowed to rot on the field or in the manure heap, the hybernating or rest-spores will be produced to carry the fungus over the winter, and new plants will be produced the following year.

Another fungus of the same genus (*Peronospora Schachtii*), attacked a crop of mangel in Queen's County. The mangels were healthy till the middle of July, when the leaves were attacked by the fungus, began to turn yellow, and then to wither. The crown became black, and the mycelium passed into the mangel, attacking different parts of the root, and producing irregular broken canker-looking patches on the outer surface. The diseased mangels must be treated in the same way as the diseased swedes.

A crop of fine walnuts in Bedfordshire was attacked by a microscopic fungus (*Septoria nigro-maculans*), which penetrated in every direction the substance of the soft husk that surrounds the nut, forming dark brown spots, and discolouring the tissues. In the worst specimens the mycelium of the fungus had followed the vessels that supply the food to the kernel through the opening in the shell, and were consuming the substance of the kernel. Nothing can be done to save the injured nuts. The diseased husks should all be burned, and, if the disease has reached the kernel, the whole should be put into the fire.

A careful inquiry is being made into the fungus which causes canker in the larch. This will form the subject of a memoir in an early number of the Journal.

The results of the inspection of the best ancient pastures in England, which occupied the month of August and the half of September, have been worked out, and form the subject of a separate paper published in the Journal [see page 751].

WM. CARRUTHERS.

REPORT OF THE CONSULTING ENTOMOLOGIST,

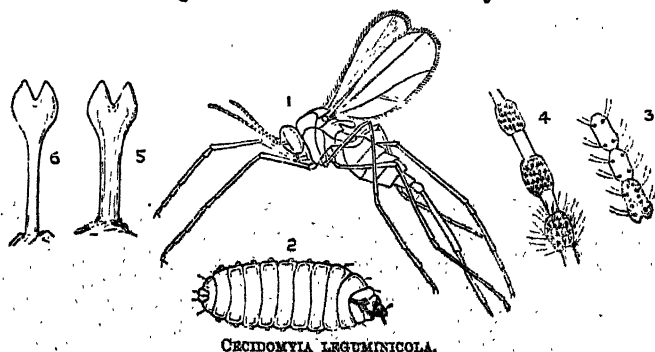
NOVEMBER 5, 1890.

DURING the past season a few kinds of crop infestations have been reported which have been little observed before, but which are sufficiently hurtful to make it desirable to notice them.

One of these is the American clover-seed midge, *Cecidomyia leguminicola*, Lintner, of which I have now had the maggots feeding in the seed-heads in summer, hibernating at the roots in winter, and have myself reared the gnat midge from larvæ sent me.

This midge is a little brownish, two-winged, gnat-like fly, only about the eighth of an inch in length.

Fig. 1.—American Clover-seed Midge.



- 1, Clover-seed midge; 2, maggot; 3, portion of female antenna, with minute hairs figured on lowest joint; 4, portion of male antenna, after Professor Riley; 5, anchor process, after Dr. Lintner, all magnified; 6, anchor process, figured from English specimens, also magnified, by Reporter. Nat. length given in descriptions.

The following is the description of the clover-seed midge given by Professor Saunders:—

The perfect insect is a minute two-winged fly, about the size and general appearance of the common wheat midge. The head is black; the antennæ long, yellowish red, with sixteen or seventeen joints in the female, and fifteen in the male. Wings nearly transparent, clothed with many short, curved blackish hairs, which give them a blackish appearance; each wing has three longitudinal veins, the third either forming a fork, or else becoming more or less obsolete towards the tip. Hairy fringe of wings paler and composed of longer hairs than those on surface of the wing. Abdomen fuscous with black hairs above on each segment; thorax black and clothed with rather long hairs. The male has an extended pair of clasping organs on the hinder extremity; the female a long pointed ovipositor, about twice the length of the abdomen.¹

¹ See paper on the 'Clover-seed Midge, *Cecidomyia leguminicola*, Lintner, by Prof. W. Saunders. *Twelfth Annual Report of Ent. Soc. of Ontario*, p. 39.

The midge lays its eggs in the flower-heads of the clover, and the maggots (which very soon hatch) may be known in a general way by their likeness to the "red maggot" of the wheat, but they vary in colour from a very pale tint to orange-red. They are about the eighth of an inch in length.

These maggots feed in such numbers on the young clover-seed as seriously to injure the yield, and when full-fed (in the regular course of things) they leave the heads and go down into the ground, or into any sheltering rubbish on the surface, to go through their changes; but some of them may be harvested in the cut clover. In summer they change to the gnat midge state very soon, but in autumn (besides what are harvested in the stack) many remain undeveloped to the gnat state until the following spring. These may be found in numbers lying near the roots of the clover, but, so far as we know, without doing them any harm.

There may be at least two broods in the season, and the amount of harm done obviously depends on whether the dates of flowering of the clover and of the appearance of the midge coincide. In the instance reported to me, where much harm was being done, near Braintree, this was towards the middle of September. It may turn out that where the seed crop is taken in July or August this may be between the early and late broods, and be safe.

One very important measure of prevention is examination of clover seed. The maggots may easily be transmitted in home-grown seed, or in seed imported from America; and all possible care, both on the part of purchasers and sellers of seed, is desirable to insure it being clean from these "red maggots." If sown they will merely be restored to natural protective circumstances by being buried, and, like the seeds, will furnish a new crop in due season.

Seed may be examined by running a handful on white paper, when the maggots will be easily distinguishable. Where the use of infested seed is unavoidable, any dressing or steep which is known to be safe for use in destroying other insect vermin might certainly be expected to destroy this kind of maggot.

The only other apparently practicable means of checking attack in infested districts are mowing the clover for hay before the seed has formed sufficiently to allow the maggots to feed to maturity, or the still more inconvenient plan of omitting clover-growing for a while.

This infestation has a power of doing so much mischief that it would be desirable to watch it. There is also another midge attack present in clover, of which as yet I have only secured the maggots near the roots in winter. The above seed attack is quite distinct from that of the clover-seed weevil maggot, which has long been known.

The stem eelworm (*Tylenchus devastatrix*), which causes tulip-root in oats and stem-sickness in clover, showed itself markedly in August in field bean plants near Woburn. The infested bean crop succeeded oats. Amongst the plants sent me for examination, one in healthy condition was between three and four feet high; the

Fig. 2.—*Field Bean Plant infested by Tylenchus devastatrix.*



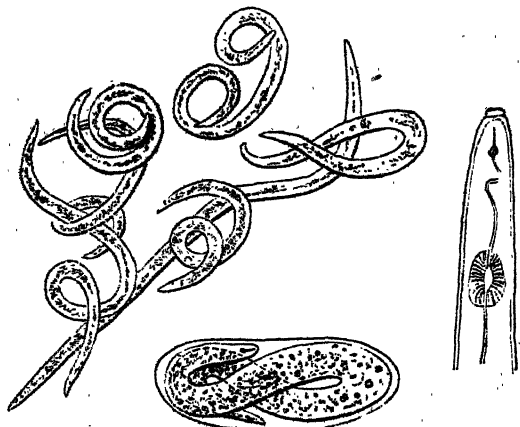
Nat. length, including curve of stem, about 10 in.

infested plants were not more than about ten inches high, and one not as much as four inches in height, with the stem widened, flattened, and swollen at the base. This stunting of the stem, the side shoots being abnormally close together, and many of the pods stunted and distorted, appeared to be characteristics of the attack. The stem eelworms were present both in male and female state, also very numerous in larval condition in soft matter inside the stem.

This stem eelworm is a minute, transparent, white threadworm, at its full growth scarcely more than 1-25th of an inch in length, and its greatest breadth may be said in a general way to be 1-30th of its length.

The treatment which has been already noticed as serviceable for prevention of eelworm attack to clover and oats will be equally

Fig. 3.—*Stem Eelworm* (*Tylenchus devastatrix*).



EELWORMS.—Anterior portion of female, showing mouth-spear, and embryo in egg, all greatly magnified; anterior portion mag. 410 times. From figures by Dr. J. Ritzema Bos.

applicable for beans, and when infestation is present probably the dressings of sulphate of potash, or mixtures of sulphate of potash and sulphate of ammonia, &c. which have been found excellently successful in stopping attack, will be as serviceable for bean attack, if applied as soon as the first beginnings of deformed and stunted growth are observable.

Another attack which has been very little noticed before, but which we now find sometimes does much harm in orchard growing, is that of a small insect, very much resembling a small froghopper, with apple-green body and four transparent wings. This is the apple chermes, or "apple-sucker," the *Psylla mali* scientifically.

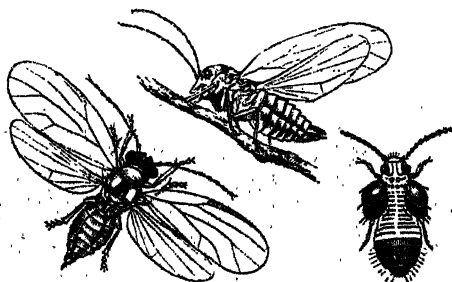
These Psyllas, or apple-suckers, I found, could run very well and then, with a sudden skip, fly away. Their length is somewhat under the eighth of an inch. The general colour is apple-green.

with the markings, as far as observable, of a pale yellow or yellowish-green. These were somewhat variable, but might be described as one central patch on the fore part of the thorax (or body between the wings), two patches or marks on the succeeding part, and narrow cross stripes on the abdomen. The eyes are in some cases pale, with the chief part reddish; in others white, with a central black spot, looking, as described by Schmidberger, like a black pupil. The antennæ were yellowish, dark towards the extremity, which was furnished with two setæ, or small bristles; wings yellowish; legs pale, tarsi pale brownish, or tips of joints and tip of tibia dark.

By September 11 the changes of colour, which accompany pairing, and which, in the case of this insect, render it sometimes hardly recognisable, were noticeable. Some of the specimens were variously patched above with red, some red from head to tail.

The *Psylla* does mischief (especially in its earliest stage, when it is still wingless) by drawing away the juices with its sucker from the buds, or flower buds, or their stalks. It lays its eggs in

Fig. 4.—“Apple-suckers,” from life, with wings expanded, and raised in act of taking flight, mag.



Nat. length one-twelfth of an inch. Pupa of pear-sucker, mag., after Prof. W. Saunders.

autumn near the ends of the shoots, and the little chermes hatch out in the spring, much at the same time as the other young orchard pests make their appearance. Where these are attended to, the apple chermes will need no special applications. They will be included in the same methods of treatment as aphides.

Hessian fly has, as usual, been of much interest to the general public; but so far as I can judge from the agricultural observations and estimates which have been sent me, and taking these in connection with the records of the five years of its total known presence in this country, there does not appear to me to be any reason to look on this infestation as being of as injurious a nature in this insular climate as several of our other corn stem pests; that is, so long as the common-sense precautions regularly advised, and based on customary methods of agricultural practice, are carried out.

Presence of Hessian fly attack has been reported to me from various localities, mainly in the counties of Hants, Herts, Beds, Northampton, Lincoln, Gloucester, Hereford, and Cheshire, and

from Market Drayton on the borders of Staffordshire and Salop, in England; and in Scotland from Errol and from near Perth.

One observation only (sent from near Perth) mentioned that the damage from Hessian fly (both to barley and wheat in that district) was considerable. The highest estimate of damage sent from elsewhere mentioned number of attacked stalks of barley in a square yard as about two in well-grown crop, ten in shortish thin crop. In square yard of wheat damage about two stalks to five.

Other reports gave respectively damage as "immaterial"; "in no case as much as 1 per cent."; "slight"; "none perceptible"; and so on; and in a return sent me by Mr. W. McCracken (late Professor of Agriculture at the Royal Agricultural College, Cirencester), he mentions that Hessian fly attack at two localities in Cheshire had not done damage of any consequence in either case.

Mr. Palmer, of Revell's Hall, near Hertford, who has carefully watched the attack since his first observation of Hessian fly, 1886, reported in July that he considered there was very little damage from Hessian fly in that neighbourhood, but could not then tell with certainty, on account of the corn being much laid by rain. After threshing, he wrote me similarly, that from the amount of puparia in the screenings he should say that there was not so much presence of Hessian fly this year as previously, which was further pointed to by the yield of barley being the largest he had had for a good many years.

Plain and serviceable means of keeping this attack in check are thoroughly before agriculturists, but a word seems to me to be needed regarding the extreme undesirableness (or even danger of greatly increasing amount of presence of attack) which would accrue if the plan which was suggested during the past season of saving the chrysalids in order to rear parasites from them should be acted on.

The plan has *not* the very important sanction of Professor Riley, State Entomologist of the United States, so far as we are concerned. In the number of *Insect Life*, the periodical bulletin of the United States Department of Agriculture, for March 1889, at page 294, Professor Riley states:—"At present, and with general entomological knowledge in its present state, there can be no doubt that it will be advisable to burn or otherwise destroy screenings which examination shows to contain puparia. It is a great bother for anyone to try to breed parasites, and for a practical man it is out of the question."

If we destroy the chrysalids in the screenings we make sure work at once, without trusting to the chance of parasites that may hatch out going to kill the Hessian fly maggot in the fields, where it will have done another season's mischief. If, on the other hand, the chrysalids are saved, it can only be as a matter of entomological trade that the parasites can be utilised. None but a skilled observer, with the help of a magnifying glass, can tell these various kinds of minute insects one from the other, and the danger appears

to me to be manifest of encouraging preservation (or importation in infested screenings) of Hessian fly chrysalids.

We are doing very well about the attack, but so far as I can judge I believe that admitting preservation of Hessian fly chrysalids, instead of destroying them by thousands when in our power (or letting them be so far destroyed as happens without any special care in customary farm service), would be likely to cause a most serious increase of the infestation throughout the country.

With regard to destruction of orchard caterpillars: From the reports sent me by various members of the Evesham Fruit Pests Committee, it appears that the application of Paris green answered satisfactorily where it was given in the very weak amounts carefully specified, and by means of such pumps as distributed it (in the manner also carefully specified) as a fine spray.

In one of the last letters I received from Capt. Corbett, the Superintendent of the Toddington Fruit Grounds, just before his much-to-be-regretted decease, he wrote me that the proportions he fixed on, namely, 1 oz. of Paris green to 10 gallons of water for plums, and 1 oz. to 20 gallons of water for apples, ought not to be exceeded. He stated that the crop of plums at Toddington was the best he could hear of, and he attributed this to following the advice received. The result at fruit-gathering time showed his anticipation of a splendid crop to be correct.

Capt. Corbett further stated that he believed the pest could be kept under, and that a more persistent course of spraying would have done so; and, further, he considered that he had made a good beginning this year, and that next year, by reason of experience gained, we should do a great deal better; "in fact," he said, "I believe we can now keep the enemy under."

Where the Paris green was used recklessly, without regard to proper proportion, and also where there was no proper apparatus to throw the spray as directed, the effects were decidedly injurious, though in some instances the trees escaped injury by reason of heavy rainfall washing the over-application away immediately.

We have now proof of the great serviceableness (as well as reasons for failure in the use) of Paris green from our own British orchard growers' experiments, and from the great mass of reports which have been placed in my hands almost continuously from February last on the subject, I think I should be able to reply to any inquiries for practical purposes as to methods, and amounts, and cautions requisite in applications, and also as to serviceable home-made pumps, which would doubtless be preferred to imported implements.

The above refers to Paris green only. In the recent report of the Evesham Fruit Committee, some of the views expressed lean mainly to grease-banding as the chief preventive of attack; using Paris green as an auxiliary; some, more to the Paris green spraying, which has the advantage of destroying all kinds of moth caterpillars which may be present, whereas greasing only stops those of wingless moths:

At the present season the grease or sticky banding is the matter requiring immediate attention, and it should be borne in mind that tar, grease with tar, or "black oil," or petroleum residue in it, or similar matters, should not be allowed to touch the bark; and, even with the most harmless forms of cart-grease, it is safer to apply them on grease-proof paper (in the manner advised in previously published reports) than to lay them directly on the bark of the tree.

ELEANOR A. ORMEROD.

ANNUAL REPORT FOR 1890 OF THE CONSULTING ENTOMOLOGIST.

DURING the past year (with the exception of orchard caterpillars early in the season) no widespread outbreak of any special kind of crop insect pest was observed. Some few kinds of attack have been more prevalent than is usually the case, but on the other hand many of our commonly troublesome infestations have been little reported.

FRICT FLY.

Amongst the more special of the corn infestations, that of "Frit fly," which was very injurious to young oat plants in 1888, was hardly noticed. Wheat bulb fly, on the contrary, and gout fly in barley, did a good deal of mischief where present. Both these infestations occur now regularly every year, and it would be very desirable if these two seriously injurious attacks could be made the subject of special observation.

HESSIAN FLY.

Presence of Hessian fly was widely distributed in England, but in Scotland it was only reported to a very limited extent, and the absence of report of the infestation there over very large districts previously attacked, as well as trustworthy reports of non-observation of it in other large areas, was very satisfactory. In every case reported to me, where estimates or definite returns were forwarded (with perhaps one exception), the amount of mischief caused was reported as slight.

FLOUR MOTH.

I am sorry to say that the flour moth, or "Mediterranean flour moth" as it is now named, the *Euphestia kuhniella*, the caterpillars of which cause serious harm in wheat mills by clogging the apparatus and infesting every spot where flour can lie, and also in stores by infesting the meal or flour, appears to be steadily establishing itself in this country. The difficulty of checking this very serious attack

(which first appeared in this country in 1887) is much increased by the natural wish of all owners of infested mills and stores that communications should be considered confidential, and consequently it is sometimes difficult, and sometimes totally impossible, to give the warnings to bakers and others round the infested centre which are required to prevent the infestation being transmitted on returned sacks to clean mills. I am, however, doing the best I can by furnishing information of such remedial measures as have to some degree answered here, and have again communicated with the Dominion Entomologist of Canada on the subject. This attack is one of great importance, as it is easily conveyed in many ways, and rapidly causes scores or hundreds of pounds of loss, or even necessity for stopping working of the mills for a while.

TURNIP PESTS, ETC.

Amongst turnip crops some mischief was mentioned from seed beetles, but no general attack of turnip aphid was reported to me, nor yet of the turnip grub, which frequently is extremely injurious, especially from the latter part of summer onwards.

Mustard crop insects were more noticed than is usually the case, and also the attack of carrot fly, commonly known as "rust."

Mangel leaf maggot was badly injurious; but with regard to remedial measures I am permitted by the courtesy of Sir John Lawes to mention the benefit received at Rothamsted by a dressing of nitrate of soda applied broadcast early in August at the rate of 2 cwt. per acre to a crop of which the whole leafage had the appearance of being scalded, brown in colour, and greatly shrivelled. After the application the plants formed new growth, and the crop when taken up gave a produce of about 18 tons of roots to the acre.

STEM EELWORM.

The attacks of stem eelworms, which are recognisable by the peculiar forms of growth which their presence gives rise to, are being carefully observed both in tulip-rooted oats and stem sick clover, and I have also recorded the first definite identification of this species (*Tylenchus devastatrix*) as infesting and stunting the growth of field bean plants [see pages 838 *et seq.*].

As yet we have no observations of the presence of this attack in potato tubers in this country, but, as it is known to be present in the tubers on the Continent of Europe, it probably is present here also.

ORCHARD PESTS.

Several kinds of crop or fruit tree attack have been little or not at all observed here before. These I have duly reported.

The attention bestowed on destruction of orchard caterpillars did much good in saving fruit where the plan was carried out under the careful directions given. Now, also, we are finding the further

benefit which I trusted would arise of a very marked diminution in the extent of the appearance of wingless moths from beneath the trees on the cared-for areas.

Mr. C. D. Wise reported to me from Toddington that the appearance of the wingless females commenced within a day of the same time as last year, but that whereas three years ago as many as 500 moths were caught on the sticky bands in ascent up one tree, this autumn nine moths was the largest number captured in any one case; and from another district I have information of observations of similar decrease in the amount of attack.

This is highly satisfactory, and is from the details placed in my hands demonstrably owing, partly to the sticky banding, partly to the use of spraying with Paris green. It is to be remembered that sticky banding can only act as a preventive to attacks of wingless moths or creatures that endeavour to crawl over the adhesive surface, and that it is to spraying that we have mainly to look in order to clear off together the legions of the many sorts and kinds which devastate together in the early spring or summer. Many kinds of washes or sprayings were tried (of too many kinds to enumerate here), but of these the most thoroughly effective, as shewn by the reports of the Evesham Fruit Committee, was the spraying with Paris green in the extremely weak proportion; and applied according to the careful directions given.

I may perhaps be permitted to note here that the practical interest taken in the orchard pest prevention by some of our very extensive landholders and influential proprietors is very serviceable.

WILLOW BEETLE.

Amongst other foliage attacks, that of the willow beetle has been very destructive, and I am giving my best attention to it.

WARBLE FLY (*Hypoderma bovis*, De Geer).

Warble attack has been greatly attended to by many who understand the importance of preventing the losses yearly occurring in damage to hides, damage to meat of the badly infested cattle, and damage by waste of health, &c., to the animals themselves. The subject has been taken up by somewhat similar publications to our own in Holland, to which I have had great pleasure in furnishing figures, and also attention is being drawn to it by Government publications in the United States.

But though here many of our hide firms and butchers' associations and leading cattle owners are most desirous to get the pest under, we are constantly held back by the ignorance and carelessness and prejudice of those on whose personal attention to the cattle their condition chiefly depends.

Very much over 100,000 of my leaflets on the subject—approximately 125,000, including those in the North and South Welsh dialects—have been distributed, and it is very rarely indeed that the

treatment advised is reported as not having succeeded ; and in these cases I have had reason almost invariably to doubt whether the directions were thoroughly carried out.

But with regard to the more general spread of information, which is still much needed, I do not see how to meet the point excepting by the subject being taken amongst the short familiar lessons in country schools.

Frequent application is made to me both by agriculturists and agricultural teachers as to how they may best respectively procure and impart serviceable information on the subject of farm pests.

In the past year the number of letters which I have written in reply to requests for identification of insects, or on points immediately connected, practically or theoretically, with injurious insect prevention has been approximately 900. This is somewhat less than in the previous year, but I do not include, in the above, attention to over 150 applications regarding warble matters, nor replies to minor matters of prevention which could be as serviceably given under my direction as written in full by myself. In all cases I have given the most careful personal attention to inquiries from members of the Society.

COLONIAL INQUIRIES.

Besides attention to home inquiries, I have also been in communication regarding various Colonial attacks. Amongst these I may especially mention procuring, at request of the Professor of Agriculture at Cairo, identification of moth caterpillars destructive to cotton in Egypt, and directing him to means found serviceable for the prevention of this kind of attack in America : also, at the request of the Agent-General for New Zealand, assisting him in gaining the most trustworthy information as to treatment suitable for checking spread of phylloxera in that Colony. For this we are indebted to courteous and prompt attention from Professor Riley, the State Entomologist of the United States, the best authority on the subject, and I am personally also much indebted to help in cases of especial difficulty to the Dominion Entomologist of Canada, and leading entomologists, both European and American.

ELEANOR A. ORMEROD.

QUARTERLY REPORT OF THE CHEMICAL COMMITTEE.

DECEMBER 1890.

1 and 2. Mr. D. Burnett, of Stockbridge, sent for analysis on August 28, 1890, two samples, one of linseed and one of cotton-cake. Both cakes were bought as pure, the price of the linseed being 8*l.* 10*s.* per ton, delivered, and the cotton-cake 5*l.* 10*s.* The following analyses and reports were returned on September 9, 1890 :—

	Linseed Cake	Cotton Cake
Moisture	12.45	12.55
Oil	9.83	5.83
¹ Albuminous compounds (flesh-forming matters)	23.56	19.81
Mucilage, sugar, and digestible fibre	34.68	32.79
Woody fibre (cellulose)	9.13	24.37
² Mineral matter (ash)	10.35	5.15
	100.00	100.00
¹ Containing nitrogen	3.77	3.17
² Including sand	4.05	—

Linseed-cake—A very impure adulterated cake, containing an admixture of rice meal and over 4 per cent. of sand.

Cotton-cake—Not a pure cake: it is mixed with cereal husk.

The cakes were purchased from Messrs. Raynbird & Co., Ltd., who invoiced them as “Best Cotton Cake” and “English Linseed Cake.”

Mr. Burnett, on complaining to the vendors, received the following letter:—

Mr. D. Burnett.

Ashley: September 11, 1890.

DEAR SIR,—We regret to receive your complaint about the cake we supplied to you on August 20. They were made by Messrs Dixon and Cardus of Northam, who have a very good reputation for their cakes, and whose make we have always understood to be as good as any English makers, and we ordered for you their best cakes of each sort. We shall be glad to receive a copy of the analysis you had made, and remain, yours respectfully,

pp. RAYNBIRD, CALDECOTT, BAWTREE, DOWLING & Co., Ltd.

ARTHUR RAYNBIRD.

Another time we will send you from another maker, and hope for better results.

3. Admiral Sir Edward Rice, K.C.B., of Dane Court, Dover, sent on September 10, 1890, a sample of linseed-cake bought from a corn factor at Sandwich. The following analysis and report was returned on September 16:—

Moisture	10.55	} 100.00
Oil	10.90	
¹ Albuminous compounds (flesh-forming matters)	18.81	
Mucilage, sugar, and digestible fibre	35.46	
Woody fibre (cellulose)	18.63	
Mineral matter (ash)	5.65	
¹ Containing nitrogen	3.01	

Adulterated with earth-nut husk.

The amount of indigestible woody fibre is more than double that generally present in linseed-cake.

4. Mr. C. P. Hall, agent for the Duke of Grafton, sent on October 30, 1890, a sample of cotton-cake. The following analysis and report was returned on November 5, 1890:—

Moisture	12.94	} 100.00
Oil	4.06	
¹ Albuminous compounds (flesh-forming matters)	22.25	
Mucilage, sugar, and digestible fibre	32.90	
Woody fibre (cellulose)	22.76	
Mineral matter (ash)	5.09	
¹ Containing nitrogen	3.56	

Not a pure cake.

The sample was taken from one of the deliveries of a lot of 25 tons, purchased at Bury St. Edmunds Market on January 16, 1890. The following is a copy of a memorandum of purchase entered in a pocket-book at the time and indorsed by the vendor :—

July 16, 1890.

Bought of — 25 tons linseed and 25 tons cotton-cake respectively, guaranteed 95 per cent. pure, for delivery at Barnham Station as required between this day and Christmas next. Cash on completion of delivery. Price—cotton 4*l.* 12*s.* 6*d.*, linseed 8*l.*

The following correspondence in connection with the matter then ensued :—

Estate Office, Euston, Thetford :
November 6, 1890.

DEAR SIR,—

Analysis—Cotton-Cake, 1,830.

I am obliged to you for your analysis of above, received this morning. As requested, I forward you invoice of the cake from which this sample was taken, together with particulars of the purchase of it. I stipulated for "pure" cake; but the vendor said, to be able to guarantee *absolute* purity was almost impossible, but that he would guarantee the cake to be 95 per cent. *pure*. With this I was satisfied. Do you consider that the sample I sent might come within 5 per cent. of a "pure" cake?—I am, dear sir, yours faithfully,

CHARLES P. HALL.

Dr. J. A. Voelcker.

November 12, 1890.

DEAR SIR,—I beg to thank you for your reply to my inquiries. With reference to the cotton-cake, I would point out to you that the impurity which I found present in it—viz. fine-ground cereal husk—is one not natural to the cotton seed, but is added to the cake, and is, therefore, an adulteration. Although I could not say that the cake in question might not come within 5 per cent. of purity, still it is not a pure cake, but adulterated with practically worthless material. Whether the quantity be large or only small, it is clearly a case of adulteration. The case in question is illustrative of the evil of a "95 per cent. pure" guarantee; particularly in the case of cotton-cake it would simply mean that 5 per cent. should be allowed; and as it is impossible to determine exactly the amount of admixture, you cannot prove whether more or less might not have been added. I would recommend you to buy your cake guaranteed pure, and to be delivered in good condition, as advised in the inclosed contract note.—Yours faithfully,

C. P. Hall, Esq.

pp. J. AUGUSTUS VOELCKER,
E. W. VOELCKER.

5. Mr. T. L. Wickham, of Chestnut Grove, Boston Spa, Yorks, sent a sample of linseed-cake which he had purchased at 7*l.* 10*s.*

per ton. The following analysis and report was returned on November 5, 1890 :—

Moisture	11·85	} 100·00
Oil	10·30	
¹ Albuminous compounds (flesh-forming matters)	21·56	
Mucilage, sugar, and digestible fibre	40·61	
Woody fibre (cellulose)	7·93	
² Mineral matter (ash)	7·75	
¹ Containing nitrogen	3·45	
² Including sand	3·30	

An excessively impure cake, containing a large admixture of weed seeds, amongst which corn-cockle is prominent. I would advise you on no account to use such a cake.

In reply to inquiries, Mr. Wickham said that the cake was purchased from a dealer who stated that it came from Hull, but refused to give the name of the manufacturers. Mr. Wickham, in ordering the cake, did not specify for pure cake, but merely said, "Send a ton of oil-cake." Ultimately the vendor changed the cake.

The following cases refer to samples of manure :—

6. Mr. J. Smith, jun., of Pattiswick Hall, Braintree, Essex, sent on November 10, 1890, a sample of a material, 10 tons of which he had bought on Braintree Market as fish manure at 55s. per ton. The manure was stated to be "condemned fish from Billingsgate, treated with a little acid." The following analysis and report was returned on November 20, 1890 :—

Moisture	18·05	} 100·00
Loss on heating	12·55	
Sulphate and oxides of iron, &c.	41·06	
Sulphate of lime	7·89	
Insoluble silicious matter	20·45	
Containing nitrogen	0·36	
Equal to ammonia	0·44	

This refuse contains no phosphate of lime and only traces of ammonia. It is not fish manure at all, and is worthless.

The following cases refer to samples of superphosphate of low quality :—

7. Mr. H. Jones, of Eaton Bishop, sent on April 26, 1890, a sample of superphosphate costing 3*l.* 6s. per ton delivered at Hereford. On analysis the sample proved to contain only 21·33 per cent. of soluble phosphate.

8. Messrs. CLUTTON, agents for Sir C. R. Burrell, Bart., sent on May 6 a sample of superphosphate, price 3*l.* 5s. per ton in London. The sample contained 19·88 per cent. of soluble phosphate, and was reported on as an inferior sample in bad condition.

9. Mr. S. T. PEDDAR, of Kennett, near Newmarket, sent on May 12 a sample of super, price 3*l.* 10*s.* per ton for cash. Analysis showed the super to contain 17·95 soluble phosphate.

10. Mr. W. J. ELWES, of Preston, Cirencester, sent on June 14 two samples of superphosphate, which on analysis contained respectively 21·52 and 22·21 of soluble phosphate. These supers were sold at 3*l.* per ton and guaranteed to contain 26 to 29 per cent. soluble phosphate.

11. Mr. W. H. COOKE, of the Green, Shelsley Kings, Worcester, sent on November 12 a sample of superphosphate guaranteed 26 per cent. soluble, but analysis proved it to contain only 21·24.

The Committee draw attention to the occasional practice of quoting or branding manures in such a manner as might lead a purchaser to believe that he was obtaining a pure article, whereas by the addition of a qualifying word such as "compound," all guarantee of purity is nullified. A case of a sample of dissolved bones described prominently in a circular as "Pure Dissolved Bones," but with a qualifying foot-note to the effect that it was a mixture, was brought before the Committee. The Committee consider that the use of the word "pure" under such circumstances is misleading.

REPORTS OF EDUCATION COMMITTEE:

(a) Report on Technical Education in Agriculture.

THE Committee have had under their consideration the Report on Technical Education in Agriculture which has been prepared by the Joint Committee of the Farmers' Club and the Central Chamber of Agriculture. The Committee have also had the advantage of perusing further communications on the subject from the Board of Agriculture, and also the Prospectus of the Agricultural Department of the University College of North Wales.

2. There is no doubt that the action which has been taken by the Board of Agriculture has done very much to stimulate interest in this subject, both amongst agriculturists themselves and amongst other bodies which are considering the general question of technical education.

3. Your Committee have reason to know that the University of Cambridge and the Yorkshire College at Leeds are appointing syndicates to consider the establishment of Chairs of Agriculture at each of these institutions; the University College of North

Wales, whose headquarters are at Bangor, has already at work an Agricultural Department, which, in addition to providing courses of study together with board and residence in the College itself, already includes a travelling dairy, and travelling lecturers on agricultural subjects, who give instruction in any localities in their own district, which may be prepared to co-operate with the College, whose lecturers are ready to suggest and supervise field experiments, either for societies or on individual farms.

4. The Charity Commissioners also have already submitted to the Committee and to the Council several schemes which are intended to provide agricultural sides at schools already existing; and they have on hand similar provisions in other secondary schools, the schemes for which are now under consideration.

5. A portion of the proceeds of the licence duties has been allotted by Parliament to the County Councils, with an indication that these funds, for the present year at least, may be appropriated in aid of technical education. Some difficulties are anticipated as to the appropriation of these funds, but it may be reasonably anticipated that in the agricultural counties at all events a portion will be allocated to the promotion of technical education in agriculture.

6. Your Committee endorse the view taken by the Joint Committee that a "thorough knowledge of farming must be obtained upon a farm, and that it cannot be obtained elsewhere." They, however, believe that (a) youths under eighteen years of age, while still pursuing their usual education, may obtain a very great amount of theoretical knowledge in agriculture, which will enable them to make a far better use of the practical education which they can only obtain upon a farm, and that (b) young men, already engaged in the practical work of the farm, may get much more enlightened ideas as to the practical part of agriculture, if opportunity be given for affording scientific instruction, and if a class of teachers qualified to give such instruction can be provided.

7. The opportunities for such teaching may be afforded, either by the institution of agricultural sides in schools, or by a system which has already proved very successful in other branches of study, viz. the development of the University Extension Lectures so as to include the teaching of the science of agriculture. For these purposes grants from Imperial or County funds might well be made (a) to establish agricultural sides in schools, (b) to encourage attendance at the same by the establishment of scholarships or bursaries for youths who might desire to avail themselves of teaching in such schools, (c) to provide salaries of teachers and scientific apparatus, (d) to assist peripatetic lecturers on agricultural science who would give courses of instruction on specified subjects in country districts, bringing home to the country towns and villages that information which, unfortunately, country youths will not go far to acquire (this has been very successful in Wales—*vide* Report), (e) to assist the Universities or larger educational institutions to establish agricultural departments which would prepare a class of teachers, and would also provide appropriate courses in college for students who

might wish to avail themselves of the instruction given, either for a term or for a complete course.

8. The recommendations (numbered 2, 3, 4, 5) of the Joint Committee, previously referred to, all tend to this end, and are such as the Council of the Royal Agricultural Society may well endorse. They are as follows:—

- (2) That State aid should be liberally given to certain Endowed and County Schools, on condition of their establishing an Agricultural side for the proper teaching of the Theory and Practice of Agriculture—practical instruction being carried out on a Farm, which might either be the property of the School—or rented by the School—or available by permission of neighbouring farmers. Arrangements should be made for the delivery of courses of lectures by the Teaching Staff or other lecturers open to Farmers of the district.
- (3) That Grants should continue to be given by the State in aid of local effort to provide Technical Instruction in Dairy or other branches of Farm work.
- (4) That aid should be similarly given to Local Agricultural Associations or Chambers of Agriculture engaged in Scientific Research.
- (5) That in all cases where State aid is afforded it should be of a permanent character, subject only to certain definite conditions laid down by the Board of Agriculture, and to the admission of Annual Inspection by an officer of the Board.

9. There remain, however, two other recommendations which are not so easily accepted. The first advises—

- (1) That there should be established and maintained, at the cost of the State, a Central Normal School of Agriculture.

If it be proposed that the Central Normal School should have attached to it an experimental farm, there is no doubt that the undertaking would be costly, and probably unremunerative; while its value as an educational adjunct may be very much over-rated. From the varied nature of English agriculture, a single establishment would be of comparatively little use, and there would probably be a narrowness in the spirit of its teaching which would render it undesirable. We must rather look forward to the movement that is now taking place at the higher seats of education in this country, which will tend to lessen the need of a Central Normal School, and which will provide more varied centres of instruction, with the adjuncts of almost every branch of scientific teaching in immediate propinquity. Other reasons might be advanced which induce the Education Committee not to recommend the Council to endorse the first suggestion of the Joint Committee.

10. The final recommendation advises—

- (6) That ample facilities should be afforded by the State to enable children in Rural Elementary Schools to acquire knowledge of their future work, either as agricultural labourers or as tenants of small holdings.

The Education Code of 1890 gives considerable scope to such school managers as may desire to teach the elements of agriculture in their schools. Beyond this it seems scarcely desirable to go at present. Too many of the children in our rural schools are already

withdrawn with only very rudimentary knowledge of the first elements of education, and are taken to work at an age which precludes to a great extent their use of evening or continuation schools. The varied age of children in village schools, from infants of three or four years old to boys and girls of thirteen or fourteen, the inadequacy, too often, of the teaching power, and the hard work already entailed on the struggling village schoolmaster, render it a doubtful question whether you should add to his labours by fresh subjects of instruction. Much possibly might be done by useful books and diagrams to be used in the ordinary course of teaching, and which might give information on rural subjects, and so awaken the interest of children in the life which is around them. The institution of scholarships to be held at Agricultural sides of secondary schools would also have an influence in encouraging children of ability to try to improve themselves in this direction; but for the present, at least, it does not seem desirable to overburden our elementary schools with any systematic teaching, even of the elements of agricultural science.

JOHN DENT DENT, *Chairman.*

November 4, 1890.

[For discussion on this Report, see Appendix, p. cxc, *et seq.*]

(b). *Report on the Results of the Junior Examination of November 1890.*

THE Committee have to report that the Examination for the Society's ten Junior Scholarships of 20*l.* each for lads between the ages of 14 and 18, took place on November 11 and 12, 1890. These Examinations have now been held continuously since the year 1874, and the following Table shows the results of the examination for each of the last seventeen years:—

Year	No. of Entries	Did not present themselves	No. of Schools	No. of Candidates who gained Scholarships	No. of additional Candidates who qualified for Scholarships
1874	29	—	2	3	—
1875	22	—	5	10	1
1876	32	1	5	7	—
1877	32	—	6	7	—
1878	29	—	6	9	—
1879	23	1	4	7	—
1880	40	2	7	10	1
1881	31	5	6	7	—
1882	30	1	5	9	—
1883	35	3	6	10	—
1884	46	1	7	10	—
1885	38	2	6	10	10
1886	43	2	6	10	5
1887	43	3	10	10	11
1888	42	3	10	7	—
1889	40	3	12	10	5
1890	42	2	14	10	6

It will be seen from this Table that whilst the number of competitors on the present occasion is about the average of recent years, the number of competing schools is the highest yet reached.

2. Of the forty actual competitors, sixteen have passed in all four subjects (Agriculture, Chemistry, Mechanics, and Land Surveying) and have obtained the number of marks necessary to qualify them for the Society's Scholarships and Certificates. These will, in accordance with the regulations, be retained until the winners of them shall have spent the ensuing year at school or college, or with a practical agriculturist upon a farm. Three other boys (two from the Aspatria Agricultural College and one from the Northampton Grammar School) passed in all four subjects, but failed to obtain the minimum total marks necessary to qualify for Certificates. Of the twenty-one other unsuccessful competitors, ten failed in one subject, seven in two subjects, three in three subjects, and one in all four subjects. There were nine failures in Agriculture, nine in Chemistry, eleven in Mechanics, and nine in Land Surveying.

3. The names of the successful candidates, with the number of marks gained by each, are given in the following Table :—

No. in order of merit	Candidate	Age	School or College	Agriculture, 400 ; pass, 150	Chemistry, 200 ; pass, 75	Mechanics, 200 ; pass, 75	Land surveying, 100 ; pass, 40	Total, 900 ; pass, 450
1	Lister, J.	15	Aspatria Agricultural College	325	143	154	85	707
2	Wilson, W.	15	Aspatria Agricultural College	290	161	148	100	699
3	Alexander, D.	16	Maybole Public School, N.B.	285	167	141	84	647
4	Robinson, W. A.	17	Sedgebrook School, nr. Grantham	276	187	163	62	647
5	Smart, E. H.	15	Portsmouth Grammar School	265	136	176	70	647
6	Daniel, J.	15	Ashburton Grammar School	268	170	100	72	610
7	Mason, W. G.	15	Aspatria Agricultural College	278	138	118	76	598
8	Hutcheson, W.	17	Aspatria Agricultural College	275	135	102	52	564
9	Gillson, W. A.	16	Norfolk County School	280	145	75	54	554
10	Arnison, C.	16	Aspatria Agricultural College	230	116	107	72	525
11	Heaman, R. G.	15	Devon County School	210	111	132	60	513
12	Edgcombe, E.	15	Ashburton Grammar School	223	110	98	48	477
13	Mills, C. H.	15	Ashburton Grammar School	180	122	109	64	475
14	Rennie, R.	17	Maybole Public School, N.B.	195	147	91	40	473
15	Johnson, H.	15	Swanley Hortel. College, Kent.	215	103	86	52	466
16	Newman, J. H.	16	Surrey County School	160	169	104	45	461

4. The Examiner in Agriculture (Mr. Primrose McConnell, B.Sc.) reports that "while there are 22.5 per cent. of failures this year as against 13.5 per cent. last year, the average marks gained by those who have passed are much higher. The average of the best ten papers is 281 marks as against 253 last year, and 252 in 1888. There is, therefore, a decided improvement on this occasion. Some of the questions were intentionally made of such a practical nature that the answers could not be found in any book, but were easy to any lad who had been on a farm, and therefore improvement under these conditions is a gratifying proof that the teaching is practical."

5. The Examiner in Chemistry (Mr. E. W. Voelcker) reports that "the results show a distinct improvement in the number of really good papers, though the proportion of candidates who have failed to obtain the requisite number of marks for passing is the same as last year. Many of the answers to the questions were really well and correctly given, and indicated that the subject had been carefully taught and studied. The papers of the candidates who failed to obtain the pass number of marks were very poor indeed."

6. The Examiner in Mechanics and Natural Philosophy, and in Mensuration and Land Surveying (the Rev. Professor Twisden, M.A.), says that he "can report more favourably of the work in Mechanics than in Land Surveying, though he was rather surprised that the first part of question 1 was well answered by only four or five of the best students. The second part of question 2 was well answered not more than once or twice; but then it seldom happens that young students can take as much as a very simple case of a body in equilibrium, and state clearly what forces are acting on it, and how they act. As might have been expected, only a few answered question 6 correctly. On the other hand, questions 3, 5, and 7 were answered at least fairly in nearly all cases, and a good many gave a fair account of question 9, and the latter part of question 10. In several schools the boys had not been taught the laws of motion in the form in which they are given by Newton. It is in this form that they are asked for in the Syllabus. The answers of the candidate placed first in this subject are very good, both as to style and accuracy."

7. Professor Twisden regards the work in Land Surveying as "not so good as might have been fairly expected. The subject, as defined in the Syllabus, could be thoroughly mastered by any intelligent boy, and he is inclined to think that, because the subject is easy, sufficient attention is not paid to it in most of the schools. Thus, question 6 was not attempted in a large number of cases, and was fully answered only twice; other questions were omitted or inaccurately answered oftener than might have been fairly expected; and the drawing was in most cases wanting in neatness. On the whole, there is room for considerable improvement, though the deficiencies are more noticeable in some schools than in others."

8. Reviewing the Examination as a whole, the Committee consider that the results are fairly satisfactory. They are glad to note the increasing attention which is being paid to Agricultural teaching in Secondary Schools, as shown by the larger number of competing centres and in other ways. It is evident that the Society's Examinations have a distinct value beyond that of the actual Scholarships and Certificates awarded, in the incentive which they naturally afford to the study of agriculture.

December 9, 1890. (Signed) JOHN DENT DENT, *Chairman.*

EXAMINATION IN AGRICULTURE.

MAXIMUM NUMBER OF MARKS, 400. PASS NUMBER, 150.

Tuesday, November 11, 1890. (Three hours allowed.)

1. Describe the best and easiest way of "pickling" seed wheat, and explain why it is done.
2. What operations are usually paid for by piecework in your neighbourhood, and what are the prices?
3. In singling out yellow turnips, state how you would distinguish them in the young stage from wild mustard (*Sinapis arvensis*), and wild radish (*Raphanus raphanistrum*).
4. Describe the construction and action of a "capillary" refrigerator for milk.
5. In lifting and storing roots, detail the differences practised in the case of mangels and turnips respectively, and explain why those differences exist.
6. Compare the cost of harvesting with string-binders as against that with reapers in the ordinary way—giving items.
7. Give the quantities of dung and artificials (if any) usually applied in your district to the following crops:—wheat, turnips, potatoes, oats, and beans. State the mode of application.
8. What methods are usually adopted in practice of preventing or curing the attacks of the turnip flea-beetle, the warble-fly, the Hessian fly, and the bean aphid?
9. What descriptions of soils are most suitable for laying down to permanent pasture? State what would be your treatment for the first four years of a field so laid down.
10. Give instances of good and bad rotations of crops, and explain why you consider them good and bad respectively.

EXAMINATION IN ELEMENTARY CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 75.

Tuesday, November 11, 1890. (Three hours allowed.)

1. What is the difference between a chemical compound and a mechanical mixture? Give an experiment illustrative of the difference.
2. Explain the following terms:—Atom, Element, Specific Gravity, Molecular Weight, Synthesis, Analysis.
3. How may the composition of water be proved? Give the physical properties of water, and explain what is meant by latent heat.
4. How is chlorine gas prepared? What are its properties?
5. Show by formulæ and explain the reactions which take place when a current of carbonic acid is passed through lime water.
6. Describe briefly the manufacture of "oil of vitriol."
7. How is phosphorus prepared? What modifications of ordinary phosphorus are there, how are they obtained, and what are their properties?
8. Give the formulæ of the following substances:—nitrate of potash, sulphate of ammonia, salt, gypsum, caustic potash, quicklime, slaked lime, ferric chloride, permanganate of potash.
9. Describe the principal tests for distinguishing between ferrous and ferric salts.

EXAMINATION IN MECHANICS AND NATURAL PHILOSOPHY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 75.

Wednesday, November 12, 1890. (Three hours allowed.)

1. Weights of 1, 3, 2, 6 lb. are placed at the angular points A, B, C, D of a square; find the perpendicular distance of their centre of gravity from A B and from A D.

If the square thus loaded were hung up by the angular point A, show in a diagram the position in which it would come to rest.

2. State briefly what is meant by the "triangle of forces."

A B is a uniform rod that can turn freely round the end A; the end B is fastened by a thread to a fixed point C, vertically over A, and D is the middle point of B C; specify the forces that keep A B in equilibrium, and show that A D C is a triangle for the forces.

3. Given three separate pulleys, show in diagrams any two ways of combining them into a "system."

If the weight to be supported is 1,000 lbs., find the power that will do it in each of the two systems.

4. State Newton's three laws of Motion, and give his illustrations of the third law.

5. If a particle moves in a straight line and in such a way that in each second its velocity is increased by 10 feet a second, find the distance it will describe from rest in 7 seconds.

6. Two bodies P and Q are connected by a fine thread, which rests on a smooth point; if the mass of Q is 8 lb., find the mass of P that in falling it may draw Q up in such a way that in each second the velocity is increased by 10 feet a second ($g = 32$).

7. Define specific gravity. What substance is commonly taken as the standard in measuring the specific gravity of a solid or liquid?

The specific gravity of copper being 8.8, what would be the apparent weight in water of a piece of copper which weighs 33 oz. in air?

8. Describe briefly the siphon, and how it is used. A and B are two vessels containing water, and A is above B; one leg of a siphon dips into the water in A, the other into the water in B; explain why the water will flow from A to B and not from B to A.

If the above system were first put in action at the sea-level, and afterwards at a considerable height (say several thousand feet) above the sea-level, what difference would there be in the action of the siphon in the two cases?

9. Define the capacity of a body for heat, and the specific heat of a body.

A pound of lead at 212° F., when put into 1 lb. of water at 57° F., is found to raise the temperature of the water to 62° F., and no more; what inference might be drawn from this experiment as to the specific heat of water and of lead?

10. What is meant by the indicated horse-power of a steam-engine?

The area of the piston of a steam-engine is 2,000 square inches, and its stroke is 6 feet long; when it is working at the rate of ten strokes a minute its indicated horse-power is 100; what is the effective pressure of the steam?

EXAMINATION IN MENSURATION AND LAND SURVEYING.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 40.

Wednesday, November 12, 1890. (Two hours allowed.)

1. The sides of a triangle are 1,700, 1,180, 1,020 links; calculate its area, and verify the calculation by drawing the triangle to the scale of 1 inch equal to 5 chains, and finding the area from the construction.

2. The area of a rectangular field is 15 acres 2 roods; the length of one side is 1,875 links; find the length of the adjacent side.

3. The circumference of a round table is 22 feet; find the number of cubic feet of wood in its top, which is $1\frac{1}{4}$ inch thick.

4. Draw a diagonal scale of inches, 3 inches long; one of the inches being divided in such a way that readings can be taken true to the one-hundredth part of an inch.

Mark the position of the points of the compasses when placed so as to take from the scale a distance of 2.74 inches.

5. A and B are two points in a straight line 1,820 links apart; A and B are on a boundary; a surveyor measures from A to B, and at the following distances takes offsets to the left—viz. at 150, 370, 560, 730 links from A, the offsets to the boundary are 25, 42, 73, 15 links; at 850 links from A the line crosses the boundary; he now takes offsets to the right—viz. at 1,040, 1,290, 1,550, 1,710 links from A, the offsets to the boundary are 20, 61, 40, 45 links. (a) Arrange these measurements in the usual form of entries in the Field Book; (b) draw the boundary to a scale of 1 inch equal to 200 links; (c) calculate the areas to the left and right of A B.

6. What is a datum line in levelling?

A and B are two points on the ground 20 feet and 15 feet above the datum line, and 300 feet apart horizontally; show the points and the slope of the ground between them in a diagram, using as a vertical scale 1 inch equal to 10 feet, and as a horizontal scale 1 inch equal to 60 feet. If the back reading (towards A) of the levelling staff is 3 feet, what is the fore reading (towards B)? If the axis of the telescope is 4 feet 8 inches above the ground, show in the diagram the position of the instrument.

Notes, Communications, and Reviews.

COVERED CATTLE-YARDS.

IN connection with the article on Covered Yards which Mr. Moscrop wrote for the last number of the Journal, it may be interesting to give the cost of a yard which my bailiff, Mr. Reid, has recently erected on one of my farms at Cattall, Yorkshire.

The yard is 61 feet square. One side is bounded by the wall of the existing farm-buildings, and the other three sides are built with railway-sleepers placed perpendicularly, and home-grown larch. The uprights in the yard, and in the exterior fencing, are made of peeled larch—whole trees of about forty years' growth, which were cut down eighteen months ago. The sleepers were picked ones, and sawn down the middle; so that the thickness of the wall is half the thickness of an ordinary sleeper, and the horizontal bracings are battens $2\frac{1}{2}$ inches by 7. The walls are about 9 feet in height inside the yard, the sleepers being 1 foot deep in the ground inside, and 2 feet outside; and there is a space of about 2 feet 6 inches between the top of the fence and the eaves of the roof, which overhang a little.

The roof is in two spans running parallel to the existing buildings; and the gable-ends are boarded down to the same level as the eaves. A stable in the old buildings has been converted into a turnip-house, with a door into the new yard; and there is also a gateway out of the yard into the fields. The whole is well spouted, and the rain-water utilised for a galvanised iron trough in the yard, the overflow from which is carried away in the drain, so as to prevent any stagnation of water round the circuit of the foundation.

The roof is of timber, constructed as described by Mr. Moscrop in the Journal. The cost of the yard has been:—

	£	s.	d.
Purchased timber	49	5	0
Larch posts (estimated)	4	0	0
Sleepers, sawing, carriage, &c.	10	17	6
Gate and posts	1	1	0
Carpenters' time	11	0	0
Masons' time	0	13	4
Draining-tiles, drainers' time, &c.	4	2	0
Iron-work, spouting, &c.	18	14	10
	99	13	8

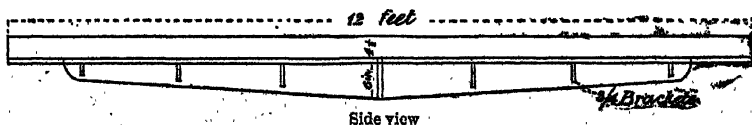
The labour of levelling the yard, and making a new road into it, and the expense of alterations for turnip-house, are not included. The tenants carted the sleepers from the railway-station, and levelled the yard. The cost comes out something under 5s. the square yard for the covering in and providing three sides of the fencing.

At present half the yard is occupied by straw, and I have no doubt that after next harvest the yard will probably be nearly filled with barley sheaves for the first threshing after harvest. I find that the covered yards are frequently used for this purpose, as they are not required for cattle until after the first lot of corn is sent to market. If the corn be not stored there for a time, the yards are always most useful receptacles each evening at harvest-time for several cartloads of sheaves which may be gathered at the close of the day. These being put in this manner under cover are ready for the stack in the early morning, when, perhaps, heavy dews may prevent the collection of sheaves in the fields.



End view

As there have been some inquiries as to the spout girder which we use between the roofs when there is a double or treble span, I add a sketch of the same. The length of the girder gives the distance between



each pillar in the yard. The cost of these girders is 8s. per cwt., and as each weighs about 9 cwt. 1 qr., the cost per girder is 3*l.* 14*s.* 0*d.*

In addition to two with slates and four with tiles, I have now erected twelve boarded roofs for yards, and I believe all my tenants are quite satisfied with them. I am inclined to think that from the thorough ventilation obtained they are very healthy for stock. The yards are not too hot, and yet are warm enough for shelter and comfort. The manure comes out in first-rate condition, and there is no accumulation of dust and dirt, and, so far, very little cost in repair. My tiled roofs have suffered far more from gales of wind than the boarded ones.

The rain-water readily runs off the roofs, and if well spouted—which I consider to be a *sine quâ non* for these yards—an ample supply of rain-water may be collected from them. Not long since I took shelter under one of my timber roofs during a violent thunder-storm, when the spouts could not carry away the water, which ran over in all directions; but only a slight spray came through the interstices of the boards.

We have not yet had experience as to the life of the roofs, but even were they to require to be renewed after thirty years, I believe they would be well worth erecting, both for landlord and tenant. I hope, however, that with proper care and attention we may look for a much longer life than I have indicated.

JOHN DENT DENT.

PRICES OF STORE CATTLE PER LIVE STONE, AND OFFICIAL QUOTATIONS.

IN the twenty-fifth volume of the second series of this Journal, (1889) I contributed, at the request of the Journal Committee, a short article on weighing live stock. I did not then give, much less enlarge upon, the reasons for resorting to this practice, or the objections raised against its adoption.

It seemed to be a subject that had passed out of the schools into the market, and that what has to be written further, to be useful, should be the experience of those who have sold and bought cattle over the machine. Among such persons will be those who, convinced by practice of its advantages, resort to this test and guide in the general course of business; some who by its means satisfy curiosity and confirm their wavering judgment at the time of a deal; and others who, unable to identify themselves with the mechanical operation in the sight of all the world, buy by hand and eye, and then concede to a believer permission to pass the purchase over the scales.

The resistance and ridicule, offered by the vendor to this ignominious and suspicious handling of the stock he has disposed of, are in proportion to the price he imagines he has obtained, above the value of the day, from the "practical man" who can do without the machine.

Anyhow, the method gains ground, and in Scotland has made a sure footing; and I am able to give the weights and prices per head and per live stone of nearly 3,000 head of store cattle bought to graze or feed between October 1, 1889, and July 1, 1890.

Some have been bought and weighed under my own eyes, but the figures and statistics relating to nearly all of them have been collected and tabulated by Mr. Westley Richards.

The sales have taken place in localities far apart, and under different conditions—at farms and fairs in Shropshire, at Welshpool, at Oswestry, at Penrith in Cumberland, at Lincoln, Rugby, Leicester, Oakham, Glasgow, and in Ireland.

The stock, as may be inferred, have been of divers sorts and qualities: rough Irish, black-polled Irish, cross-bred polled Galloways (blue-greys)—"beauties"; rough, horned, very coarse Irish—"beasts"; Welsh runts, Hereford cross-bred and pure-bred, shorthorns, English pure and cross-bred Irish, horned and dishorned, heifers of all the above breeds, superior and inferior, and some few cows, and to these are added from the Dominion some nice Canadians.

The first lot of stores I have an account of is one of 700, sold in October 1889 by one grazier in Ireland. They were rough cattle, Mayo mountain bullocks, weighing sixty-three stone each and costing in Ireland 10*l.* 18*s.*, the price per stone being 3*s.* 5½*d.* On the 26th of the same month 12 cross-bred polled Galloways, blue-grey, best quality, weighing 68½ stones, cost in Rutland 4*s.* 6½*d.* per live stone, and on November 23, 5 pure-bred Galloways, 63 stones,

4s. 9½d. and one smaller and younger, 52 stones, 5s. 0½d. per stone. About the same time 21 black-polled Irish (64 stones) were bought at 4s. 6½d. at Leicester. In February 1890, 15 Hereford oxen, cross-bred, weighing 61 st. 1 lb., each made 4s. 7½d. per stone at Shrewsbury, and 16, a year and a half old, 58½ stones, made there 4s. 8d. per stone; 64, two and a half years old, 64 stones, made there 4s. 7½d. per stone, and 20 heifers, two years old, 55 st. 12 lb., 4s. 9d. per stone; while 8 inferior shorthorn heifers, 60 stones, made but 3s. 9½d. In the same month, three-year-old best Welsh runts at Oswestry, 80 stones, made 4s. 6d. per stone, and the same description, 59½ stones, 4s. 8d. per stone at Craven Arms. On April 2, 20 of the same sort, (outlayers), 68 st. 5 lb., cost at Leicester 5s. 0½d. per stone; when also cross-bred polled Galloway heifers, excellent quality, not two years old, 51 st. 1 lb., cost in Cumberland 6s. 3d. per stone (much too costly) and shorthorn oxen, home-bred, fair quality, 76 st. 5 lb., cost at Leicester 4s. 8d. per stone.

On May 1, homebred shorthorn bullocks, 74 stones, made 4s. 9¾d. per stone at Lincoln. At the same date, 60 dishorned Irish oxen, three years old and fresh, 66 st. 2 lb., made 4s. 5d. a stone in Ireland, their carriage to the Midlands would add 2½d. a stone to their cost; and 40 dishorned Irish heifers of the same breed, 48 st. 11 lb., cost in Ireland 4s. 7¾d. per stone, while a similar lot of 4 at Shrewsbury, 57 stones, were bought at 4s. 6½d. per stone. Welsh heifers at Leicester at that date, 45 stones, made 4s. 10d. to 5s. 2¾d. per stone, and shorthorn heifers, to keep round, 52 st. 7 lb. down to 39 st. 1 lb., cost at Leicester 4s. 8d. to 5s. 8d. per stone. These Welsh shorthorn heifers could not at such prices be expected to make a profit to the grazier who fed them. At Leicester Fair, however, some good shorthorns, on May 12, 74 st. 8 lb., made as much as 5s. 3d. per stone, and black-polled Irish heifers, good quality, 56 stones, 5s. 2½d. per stone, but these were dangerous prices to buy in at.

Shorthorn bullocks, however, at Shrewsbury, from 46 to 51 stones, were making 5s. 1d. average per stone, and shorthorn barren cows, 68 stones, 4s. 7¾d.; Herefords (barreners), 63½ stones, 3d. a stone more money, while Hereford heifers, 12 of 48 stones, 27 of 55 stones, and 48 of 48 stones, made respectively 4s. 11½d., 5s. 1d., and 5s. 1½d. per stone, and 50 Hereford barreners, 61½ stones, 4s. 9d. per stone; 40 two-year-old Hereford steers, 63 stones, made 5s. 1½d. These could not have been well bought. So much for the month of May.

Coming now to June 4 and Glasgow market, 4 Canadian heifers, 64 stones, made 4s. 1½d., and 20 oxen, some polled, 5 coarse, but the rest well bred or nice, made from 3s. 6½d. to 4s. 8½d. per stone—these beasts have, it is believed, paid for grazing. In July, 322 Hereford bullocks at Shrewsbury, scaling from 52½ up to 70½ stones, made from 4s. 8d. up to 5s. per stone, and 128 Hereford heifers, weighing from 44½ up to 54 stones, made from 4s. 9¾d. to 5s. 1d. per stone; 123 shorthorn heifers of 60 stones, making 4s. 11d., and bullocks 4d. less. In July, at Shrewsbury, heifers came down 2d. per stone.

Here, then, is a sketch of the cost per stone of nearly 3,000 head of store cattle which has been collected and tabulated by private

individuals, mostly by one person. All the trouble, labour, and expense of these statistics have been furnished by private enterprise.

The knowledge thus obtained, only published as it is now, long after the store cattle trade is over, can be of no service to those who were engaged in it during the past twelve months. Could the information have been officially made public from time to time as the sales came off, how interesting and instructive it would have been to buyers or sellers of stores at the time, and how much such information would facilitate transactions between buyers and sellers at a distance from each other, or the execution of orders on commission!

It is not too much for agriculturists to ask of the Board of Trade, or the Board of Agriculture, to procure such returns and publish them weekly for public use. They may be incomplete, possibly meagre, at the outset, but it is now well known that there are in England, Ireland, and specially in Scotland, auctioneers, cattle-dealers, breeders, and graziers who could, and many who would, willingly give the information, if furnished with forms for its transmission to the Department of State charged with the preparation and publication of these statistics. For the purposes of farming business, such returns would undoubtedly prove of greater value to agriculturists than the present annual agricultural statistics. The one would be a guide to the buyer and seller, while the other—which is not—is of service only to the statistician.

The Board of Agriculture has invited the co-operation of the Royal Agricultural Society of England in the suppression of contagious disease in animals, and there can be no question but that the points of contact between the Department of State and the Society will be many, though the functions of the two institutions are and must be different.

Now, this Society publishes periodically, in its Journal, statistics affecting British agricultural interests. Among them is a table with the price of wheat for the year, depressing enough just now, but which will be referred to with interest in future years. Another table gives the average prices of British corn from the *London Gazette*, while the average price of wool per lb. is given in another table under four different qualities.

If a student or statistician in years to come, or indeed at the present time, desired to know the current value of store cattle, he would find this Journal silent as regards official information, for the best of reasons—that the State has not troubled itself to procure and furnish such information.

Perhaps without public weighing-machines it was not possible to do so. We know all about it on the other side of the Atlantic, and next to nothing in the case of cattle reared and fed in our own country. There has been hardly any general importunity on the subject, and it requires pressure to move great departments of State. As the present want of knowledge which is really obtainable is discreditable to the country at large, and to agriculturists in particular, the attempt to remove it would surely be one in which the Royal Agricultural Society of England might take hearty and zealous action.

ALBERT PETT.

CHICKEN AND POULTRY FARMING IN GERMANY.

HERR GRUENHALDT, of Schloss Walmünster, Post Teterchen, Lorraine, a Hanoverian by origin, was long engaged at Heidelberg in the invention and construction of incubators, and in hatching out chickens for those who sent him eggs and employed him in that way. He is now in the occupation of the Schloss, or château, in question, and with the option of purchase; the land attached, beyond gardens and orchards, is inconsiderable—in all some thirty English acres. The soil is rather of a stiff and retentive character. The Herr is a married man, with one daughter, and of scientific tastes, employing in his house, for bells, telephone, and for regulating the temperature of his incubators, thirty electric batteries or jars; he is also a photographic artist, and executed excellent illustrations of his surroundings and operations, a few of which have been utilised for the woodcuts that accompany this paper.

I have no precise knowledge as to the proposed arrangements, but I rather gather that Herr Gruenhaldt intends to institute courses of practical instruction in the art he professes.

The village of Walmünster is twenty English miles north-east of Metz, and has a population of about 100 souls, little farmers and their belongings, who speak a bad German dialect; but at the Schloss pure German only is spoken. All the incubators for use and sale, together with all the other appliances used in poultry-raising, are made at home.

Practically all the chicken and poultry food is purchased, as buckwheat, Indian meal, fish made into baked cakes, &c. Three cows are kept, but from four to eight gallons of milk are used every day for the poultry food. Windfall fruit, cabbages and garden refuse are used largely, being pitted for winter, and afterwards boiled. There are no horses; communication with the railway-station, distant three and a half English miles, is kept up by telephone, and by post-cart which passes twice daily.

The stock advertised as always on hand is from seven to ten thousand head of poultry, chiefly chickens, with turkeys, geese, ducks, guinea fowls, and rabbits—the common tame rabbit. The geese are the large Italian, which are said to grow to twenty-five pounds. The ducks are Aylesbury and a sort of half-wild duck. The chickens are of various breeds, as Plymouth, Dorking, Cochins, Bramahs, Houdans, Langshans, &c.; but the various breeds are to be reduced to four, the multiplicity causing confusion in the execution of the various hotel and other orders, viz., two French breeds, one English, and one German. Herr Gruenhaldt has a high opinion of a small white German breed called "Ramelsloher," from a village of that name near Hamburg; they are excellent for table, good winter layers, and hardy. In that village all the inhabitants raise chickens in winter; they are hatched out in the natural manner, but kept

warm in the kitchens, and, so raised, command the best prices in the early spring markets.

As might be expected, the Schloss is not without a considerable population of rats and mice.

The value of the produce is thus estimated: Smaller chickens, fat, and sent all over Germany, packed, dead, in hampers, 1 mark 60 pf. (1 mark=1s. English). Larger, 2 marks 60 pf. Some exceptionally large and older, 4 marks 50 pf. A goose, after being plucked, cleaned, and trimmed, sells for 11*d.* per English lb. The feathers are sold, white feathers being most in demand; and all the

Fig. 1.



1, Roof space occupied by chickens; 2, the English student's room (two windows); 3, position of incubating room (for interior see Fig. 5).

birds of all kinds sold are plucked, cleaned, and sent off six hours after they are killed.

The staff employed—the master, Herr Gruenhaldt, excepted—is, in addition to one maid in the house,—

One clerk, for hotel and other correspondence;

The manager, a Hungarian, a man skilled in poultry art;

One foreman, who is not concerned in the poultry business;

Three boys, who mix food, and attend and clean and shut up the poultry at night under the direction of the manager.

Three or four men are employed on the place for the cows, garden, orchards, etc.

Extreme cleanliness is an essential feature of the poultry manage-

ment—a cleanliness observed in all the departments ; and even then it is difficult for an outsider to understand the possibility of long-continued avoidance of fouling and foiling the spaces occupied.

The orchards contain some 1,200 fruit-trees, plums, apples, pears and peaches, which are sold, and go to North Germany and elsewhere.

The illustration on page 866 (fig. 1) represents the front of the house, and it is interesting as showing the complete conversion or desecration of the old French château residence. The roof space is entirely occupied by newly hatched-out chickens, and they remain there for six weeks. Here, as elsewhere, the utmost attention is paid to cleanliness. There are three tiers of cages, with trays, well sanded, which, canary-cage-like, draw out. I saw about twenty chickens

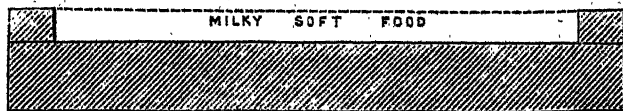
Fig. 2.



in each cage. Any number of wood sparred fronts (fig. 2) are provided, which are interchangeable and washed daily ; they drop into wood slots.

The feeding trough, washed constantly, and always in use, is about a yard long or under. Section, full size, is shown in fig. 3.

Fig. 3.

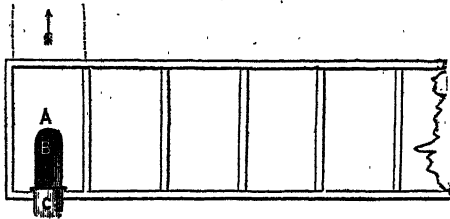


The poultry courts or runs are at the back of the house, and each one averages perhaps thirty by forty paces ; they are on grass, with shrubs inclosed, and shelter buildings some seven feet high, in which the chickens are shut at night. They are, from six weeks old, kept in the courts, and for six weeks longer (i.e., twelve weeks in all), or to a period when best fitted for sale. Many are sold fat at three months old. There are, in all, nineteen courts, and an estimated mileage of wire net (close at bottom, larger mesh above) equal to six English miles.

Several hundred fattening cages are in use in two or three tiers. They are without light except from the opening, as shown in the sketch (fig. 4), and just big enough, and no more, to hold one bird. A very wide perch, oval on the section, is constructed within.

No doubt, on an emergency, to meet orders and otherwise, eggs and poultry can, as well, be obtained in the village and neighbourhood : in short, the Schloss and village to some extent co-operate.

Fig. 4.



A, Slides up—a slide door ; B, opening for air and food, takes bird's head and neck only ;
C, milky food in a tin dish.

The annexed illustration (fig. 5) gives an idea of the interior of the Incubating Room.

Fig. 5.



1, 1, Thermometers ; 1a, instrument for examining eggs to ascertain incubation ; 2, 2, 2, indications of electric wire conductors for regulation of heat by means of thermometer at 1 ; 3, lamp for heating, regulated by electricity ; 4, papers indicating particulars, time due, kind of eggs, &c.

The turkeys, geese, ducks, and guinea fowl, are for convenience hatched under hens, as they require longer time.

The incubators are made, on the place, of wood and tin, or zinc ;

there are several patents. The incubators already in use are six in number, and each takes 500 eggs. After five days the infertile eggs are removed, and sold for cooking, and replaced with other selected eggs. Assuming the demand, the supply might readily be made very considerable, say, with six machines for incubation and ten batches in a year, $500 \times 10 \times 6 = 30,000$ chickens a year; say a profit of one mark (1s.) per head sold, this would give a profit of £1500.

Incubation is affected by thunder, and curiously enough it was noted the eggs did not hatch out well during the army manœuvres, when, within a mile of Walmünster, batteries were placed on either side of the valley, and there was all day firing of great guns. The newly acquired estate of the Emperor is not far off, and his Majesty was expected to visit Walmünster this autumn.

It only remains to be said that Herr Gruenhaldt is a well-educated man, very ready, out of business hours, to converse agreeably in his own pure Hanoverian German; he writes and understands English, but never uses that language in conversation; his family, wife, and daughter, are amiable; and, altogether, for a young man desirous of learning conversational German, not to mention other matters, the *gîte* is agreeable and desirable.

A. H. CATHCART.

GROSS RENT v. NET RENT.

THERE is perhaps no point connected with the ownership of an agricultural estate, and at the same time having an important bearing upon its successful management, which is so little heard of, and consequently so generally ignored, as the difference between the *gross* rent paid by the tenant, and that portion of it—the *net*—which ultimately reaches the landlord's pocket.

The landlord, especially if he be an "improving one," desirous of giving his tenants all the facilities necessary to enable them to make the best of their farms (and which of our large landowners is not so?) knows too well that the cost of maintaining his estate in a satisfactory and proper condition, and of executing the various improvements which are from time to time demanded of him, encroaches considerably upon the gross rentals paid by his agricultural tenants. This knowledge has been specially forced upon him during late years, because, with the fall of rents on the one hand, and the increased cost of labour and materials on the other, the encroachment has been taking place at both ends of his rent-roll. The growth of his proportionate expenditure has also been augmented by other causes, for, beyond the increased cost of ordinary repairs, there have been changes taking place which have called for more outlay on the landlord's part—as, for instance, the great change in some districts from arable to pasture, and the consequent necessity for more buildings; the subdivision of farms in revulsion of that

throwing together which the economic causes now under consideration led to in the past, but which the results have shown to have been mistaken policy ; the greater attention paid to the provision of comfortable and convenient cottages ; and the growing requirements of sanitary authorities in the matters of sewerage and wholesome water-supplies, and so on.

All these, to say nothing of sundry drainage and other improvements from time to time necessary to maintain rents, have contributed to the lessening of the proportion of gross rents which landlords have had available for their own housekeeping and other expenditures. Nor is this demand for outlay on the landlord's part likely to lessen in the near future ; for the margin of profit from the occupation of land is too small, and the means of the working farmer tenant now so much sought after are often too limited, to enable the occupier either to do the improvements himself, or to go without them without unduly limiting his powers of doing justice to the land. Also the transfer of control and of the right of inspection to the Board of Agriculture in the case of outbreaks of cattle-disease, and the casting of the payment of compensation upon the national exchequer, will doubtless be shortly followed by compulsory provisions for more space and ventilation in cattle-sheds and improvement of water-supplies, which will not unfrequently lead to their entire remodelling. But of the amount of this expenditure little or nothing is ever heard, because our landowners, even if they notice it very closely, seldom care to mention it ; and so the would-be land reformers, if they give thought to the matter at all, have to resort to guess-work, with its consequent very inadequate conclusions, or else, as is more generally the case, they find a convenience and encouragement in altogether ignoring it. Hence, agitators for the redistribution of land, and advocates for the re-establishment of small holdings, plod on in happy unconcern of that one great practical difficulty in the way of the success of their schemes.

A recent return to Parliament in the Report of the Select Committee on Woods and Forests and the Land Revenues of the Crown, however, lets in a little light upon the point under consideration, and shows tolerably clearly what the cost of keeping an estate in order and up to modern requirements means to an improving and considerate landlord.

The statement on pages 872 and 873, submitted by Col. Sir Nigel Kingscote, K.C.B., and compiled by him from figures supplied by sundry private landowners, gives the actual figures connected with eleven estates in as many different parts of the kingdom, selected as typical instances of reputable and judicious management.

It will be noticed that, with the exception of No. 3—as to which the figures are extraordinary and quite abnormal—there is much uniformity in most of the percentages of outlay, and that the averages of the figures given show that, inclusive of fixed charges and donations to schools (to avoid permanent rates, &c.) about one-third of the gross rents is absorbed in the maintenance and improvement

of the estates. There is little doubt that this table could have been considerably extended by the inclusion of other and smaller estates without any material alteration of the results.

With a continuance of such rates of expenditure over only a limited number of years, "What," it may be asked, "has or will become of the prairie value?" The fact is that this prairie value has long since disappeared; and, nowadays, an agricultural estate cannot be kept in order and up to modern requirements in respect to the provision, maintenance, and repair of its buildings, fences, and drainage, and to the execution of the many and various improvements demanded and necessary to command good tenants, without a large encroachment upon the gross rentals. Indeed, it may be safely averred that once at least within a century the fee simple value of the land has to be expended by its owner in maintaining its rental.

The returns referred to do not, of course, show how much of the respective outlays will be productive of interest in the shape of increased rents; nor is it necessary here to take that matter into account, because the point to which this note is directed would not be affected by it. The outlays, it is only fair to assume, were undertaken because they were considered necessary to secure the most profitable occupation of the land, and, whether or not additional rent is to be paid in respect of them, the money had all the same to be provided, for without them the occupiers would not have been in the position to make the best of their farms. The probability, however, is that a very small proportion only of the expenditures is being followed by increased rents, but that rather the outlays on improvements were found necessary for the maintenance of the old rentals.

The point under consideration was strongly impressed upon another Committee of the House of Commons—viz., that on Small Holdings—and nearly every witness referred to it. The Committee in its Report frequently alludes to the difficulty arising from the provision and maintenance of buildings, and describes it as "almost insuperable under present conditions" in the matter of the re-establishment of small occupations. It fell to the lot of the present writer to show to the Committee that this very difficulty had been one of the chief causes for the regrettable disappearance, since the beginning of the present century, of the small "Statesman," or Freeholder of the North, and that, coupled with other economic causes still applicable to the holding of land, it had led to their voluntarily disposing of their patrimonies rather than hold them under circumstances which caused such material reduction in their incomes.

It is to be feared that the proposal of the Committee to shift the burden on to the occupier's shoulders will be found as insuperable to the establishment of the proposed occupying but partial owner as it has been in the past to the retention or maintenance of small occupations. Only large and wealthy proprietors can afford the present difference between gross and net rents, without unduly limiting the assistance and accommodation afforded to the tenant.

R. PUNCHARD.

COMPARATIVE STATEMENT
Of Receipts and the Percentage thereon of the Expenditure on Eleven typical Private Estates and on the Crown's Country Estates (including Mines).

Name or distinguishing number	PERCENTAGE OF EXPENDITURE												OBSERVATIONS		
	TOTAL RECEIPTS		Agency		Repairs and improvements		Fixed charges & donations to churches, schools, &c.		Miscellaneous		TOTAL EXPENDITURE				
											1887	1888		1887	1888
The Crown	£	125,689	£	119,406	4.3	4.7	14.9	10.4	0.7	0.7	8.1	5.9	28.0	21.7	Expenditure on farms in hand particularly heavy in first year. Expenditure does not include any part of office establishment provided for out of probationalary vote.
No. 1	45,459	46,705	5.0	5.0	21.5	21.3	8.3	8.5	4.2	4.4	39.0	39.2	39.2	31.5	Chiefly arable, moor, or woodland. Tenants undertake all repairs.
No. 2	20,863	21,329	4.0	3.9	31.8	21.4	1.7	1.6	4.3	4.6	32.3	31.5	31.5	31.5	Estate situate in two adjoining counties, with a considerable extent of dairy farms and some town property. Landlord repairs main walls and timbers and roofs, and provides new gates and doors, but tenants expected to do other repairs.
No. 3	27,737	27,502	5.2	5.1	77.9	99.9	9.4	12.4	4.7	4.6	97.2	122.0	122.0	122.0	Estate situate all in one county, chiefly agricultural (a good deal of dairy land), and about one-sixth of house property. Tenants only required to keep fences, gates, ditches, &c., in repair. Other repairs done by landlord.
No. 4	23,898	29,227	5.5	5.3	24.5	22.1	3.3	3.6	6.9	6.6	40.2	37.6	37.6	37.6	Agricultural, and in one county only. Tenants undertake to repair, materials being found by landlord, but of late obligation to repair not strictly enforced.
No. 5	26,739	24,919	3.0	3.2	17.1	18.4	.9	.8	3.0	2.8	24.0	25.2	25.2	25.2	Agricultural, and some house property in one county. Tenants undertake repairs except to main walls and main timber.
No. 6	16,903	15,666	3.1	3.0	22.3	16.0	2.3	2.5	3.5	3.0	31.2	24.5	24.5	24.5	Six small agricultural properties in one county, managed by agent managing No. 5. Tenants repair, as in No. 5.

No. 7	19,268	17,725	3-1	3-9	25-2	22-5	8-3	4-1	7-3	7-6	39-9	38-1
No. 8	117,000	117,147	4-8	4-8	25-2	22-3	8-7	5-7	2-8	2-8	36-5	35-5
No. 9	19,325	18,748	4-3	4-5	10-6	9-0	3-1	3-1	6-4	7-1	24-4	23-7
No. 10	135,407	139,985	6-5	6-8	19-3	18-0	4-9	4-5	7-0	7-5	37-7	36-8
No. 11	46,443	46,574	3-1	3-1	21-0	26-1	1-4	1-7	—	Not stated	—	—
TOTAL receipts and average expenditure, for the 2 yrs.	504,072	494,527	4-3	4-4	25-8	26-9	4-0	4-4	5-0	5-1	40-1	41-4
TOTAL receipts and average expenditure for the 2 yrs.	£499,349		4-3		26-3		4-2		5-0		40-7	
TOTAL receipts and average expenditure, omitting Estate No. 3	476,385	467,195	4-2	4-3	20-6	19-7	3-4	3-6	5-1	5-0	33-8	32-4
TOTAL receipts and average expenditure, omitting No. 3 for the 2 yrs.	£471,790		4-2		20-1		3-5		5-0		33-0	

In one county, chiefly agricultural, but about one-sixth of receipts derived from house property. Tenants repair, landlord finding materials.

Estate situated in one county, chiefly agricultural (largely consisting of grazing land) and woods. Donations, &c., exclusive of donations made direct by landlord.

Estates in several counties, principally agricultural, but some building properties. Generally speaking, tenants undertake to repair, landlord finding materials, but extensive repairs mostly done by landlord.

Estates in several counties. Agricultural, woods, and a substantial portion buildings (ground rents). Tenants undertake to keep premises in tenantable condition, but obligation not strictly enforced.

Agricultural estate in one county, comprising about 20,000 acres.

Note.—Average of each column calculated according to number of estates for which the information contained in that column is given.

The slight difference between the average total expenditure and the total of the averages of the separate items of expenditure is due to the fact that the total and miscellaneous expenditures for Estate No. 11 are not given.

In that case either the total expenditure must be above, or the miscellaneous expenditure be below the average of the remaining ten estates.

THE VEGETABLE SUPPLY OF A LARGE TOWN.

THE growers of the market-garden produce which is disposed of in Paris may be conveniently grouped in three classes—(1) the market gardeners of the Department of the Seine, which includes the city of Paris ; (2) the cultivators in the adjoining Departments of the Seine-et-Oise and the Seine-et-Marne, the produce of which is conveyed by road into the city ; (3) the provincial or even the foreign growers, whose saleable material is consigned by rail to agents in Paris.

These various classes of cultivators sell their produce for the greater part (*a*) to dealers—usually women—who retail in the Paris markets ; (*b*) to greengrocers, who may, or may not, hawk the produce in the streets ; (*c*) to makers of preserves (jams, pickles, &c.) ; (*d*) in the case of foreign produce to agents, when the market is sufficiently active to warrant an excursion to England, Belgium, or Germany.

The second and third classes of producers, especially the former, still sell their choicest produce, however, to the local markets, which supply the better quarters of the city. This produce, therefore, does not pass through the Central Market.

The market gardeners of the Seine number about 2,400, quite one-tenth of whom cultivate land within the boundaries of the city of Paris, the market gardeners of Grenelle-Vaugirard alone amounting to 112.

A Paris market garden of one hectare (equivalent to about 2½ acres) usually finds occupation for three men and two women. One man is the *patron* (proprietor or master), and the two others are known as *commis* (clerks, salesmen, or agents), though they spend most of their time using the spade or rake. The female hands are the *patronne* and her servant. A horse is kept for pumping water from a well to a reservoir conveniently situated for watering the garden, and in addition he takes the vegetables to market. The conveyance containing the produce for sale leaves the garden at about two or three o'clock in the morning, and the vegetables are unloaded upon the pavement of the streets adjoining the market. A fixed site for this purpose is always occupied by the same market gardener, and passes to his children or successors. Failing the latter, the municipal authorities dispose of the vacant place amongst those who for a long time may have occupied less favourable positions. The rent of these places ranges from 15 francs (say 12 shillings) per month upwards. The vehicle which carries in the produce seldom returns empty, the most important material which it takes back being stable manure for use in the gardens. As soon as the market is open, the dealers, the greengrocers, and the *chefs de cuisine* of the large restaurants, together with other buyers, commence their rounds of inspection and make their bargains with the *patronnes*. The female assistant delivers the purchases to the dealer, to the greengrocer's attendant (*gardeur*), to the employé of the preserve-maker,

or to the agent, and the cart or waggon is ready for its return journey. Early in the morning the *patron* draws or cuts the vegetables for the next day's sale, and prepares them for market; general work in the garden keeps the other hands employed in the afternoon.

Farther away from Paris the gardens are distinguished from those of the Seine by their greater extent, and by the use of the plough rather than of the spade; the produce which is raised, moreover, is rarely cultivated under glass, and comprises nearly all the culinary vegetables, with certain specialities determined by the nature of the soil and the situation. It may be generally stated that the suburban cultivator works about three hectares (say seven acres) of land, and obtains therefrom a gross annual income of 10,000 francs. Peas, French beans, asparagus, chicory, carrots, onions, turnips, early potatoes, dandelions, and winter salsify are the principal products within a radius of half a dozen to a score of miles around Paris. Conveyed in by road, the produce is deposited alongside the markets, the municipality imposing a tax for the space which is thus required. The hours of sale for these suburban cultivators begin and end an hour later than the corresponding times in the case of the Paris market gardeners.

The third class of producers, who reach Paris by rail, are the small market-garden proprietors of the Île-de-France, the Boulonnais, and Brittany, but especially of Provence and Languedoc. Some are even as far away as Algeria, Andalusia, and Milan. The quantities of garden produce carried into Paris by the five great railway companies are very unequal. For last year the weights were (1 kilogramme=2·2 lb.)—

Railway	Kilogrammes
Compagnie de Paris-Lyon-Méditerranée	20,593,412
" Paris-Orléans	2,676,556
" l'Ouest	5,072,334
" l'Est	175,218
" du Nord	1,460,802
	29,978,322

The Western Railway (de l'Ouest) runs through some important market-garden districts—Limay, Louviers, Elbeuf, the coast of Calvados, Anjou. But the region which more especially furnishes Paris with its supply of winter vegetables, including cabbage and cauliflower, is the part of Brittany between Brest and Cherbourg, washed by the tepid waters of the Gulf Stream. In the south, special mention should be made of the Departments of Vaucluse, Var, Bouches-du-Rhône, and Alpes Maritimes.

The Compagnie d'Orléans, in conjunction with the Compagnie de Lyon, carries to Paris the consignments from Perpignan and the importations from Spain. All the railway companies, but these in particular, receive fresh vegetables and transport them to Paris with remarkable care and promptitude. They are there delivered to agents who generally carry them to the markets, or they are sold by auction.

The 30,000 tons of vegetables which were last year poured into Paris by rail possessed an estimated value of 12,000,000 francs (approximating to half a million sterling). Yet they formed only a tenth part of the supply, if we assume each of the 935,000 vehicles which discharged their loads at the gates of the Central Market to have carried 300 or 350 kilogrammes.

Though France exports fresh vegetables largely, yet from their nature these are not qualified to undergo long journeys. Hence the preserve-makers are to be found everywhere, and the good quality of their materials, combined with the care bestowed upon manufacture, results in their produce being entitled to rank in the first class. The factories devoted to the preservation of green peas, French beans, and tomatoes are many and important, and three-fourths of the resulting products are exported. Asparagus and several other vegetables are similarly treated. As an example may be mentioned the case of a manufacturer who in a single year (1889) preserved 400,000 kilogrammes of sorrel, a salad herb which is as much appreciated in France as it is neglected in England.

As bearing upon the general question of supplying large centres of population with fresh green food, it is submitted—

1. That municipalities should so organise their markets as to facilitate the rapid and effective distribution of vegetables amongst consumers.

2. That means should be adopted to protect the interests of distant cultivators.

3. That the fiscal arrangements should be the most favourable possible to an industrious and deserving class of men.

MAURICE L. DE VILMORIN.

THE TENANT'S COMPENSATION ACT, 1890.

THE Agricultural Holdings Act 1883, which was explained in vol. xx. of the second series of the Journal, has now been in operation for very nearly seven years, a period sufficiently long to have thoroughly tested its provisions. Although it has quite lately met with some severe criticisms, yet the criticisms have been directed to the mode in which the provisions of the Act have been carried out, or to the neglect to carry them out, rather than to the provisions themselves. The Act has, we may say, stood the test of experience very well. There have been but few flaws detected in it, but it has been found that in some parts of the country, and, as was to be expected, notably in those parts in which a liberal tenant-right custom exists, tenants prefer to make their claims for compensation under the custom instead of under the Act. Perhaps the Act is least satisfactory from the tenant-farmer's point of view, because of the facility it affords to landlords to make counter-claims, and because it does not

allow compensation for the consumption of corn and other feeding stuffs grown upon the holding ; and suggestions have been made that it should be amended by specifying in a schedule the matters upon which landlords should be allowed to make counter-claims, and by allowing corn and other feeding stuffs which have been produced on the farm and consumed by stock upon it, to be, within proper limits, subjects for compensation. But, as yet, no amendment in either of these directions has been made.

An Act, the short title of which heads this note, was, however, passed in the last session of Parliament, which, by way of amending the Agricultural Holdings Act, in fact amends the law of landlord and tenant, and remedies what was previously a severe hardship on tenant-farmers, though one which was seldom felt, and the risk of which was, for the most part, known to lawyers rather than to farmers. The hardship was this :—If the farm was mortgaged when the farmer became tenant, and the mortgagee did not consent to the lease or agreement for the tenancy, he was not bound by it, but was entitled to treat the tenant as a mere trespasser, or, in other words, to disregard the tenancy, and, if necessary, to turn the farmer out of the farm without any notice. This was the law prior to January 1, 1882, but by the Conveyancing Act of 1881, which commenced on that day, (amongst other leases) an agricultural lease for any term not exceeding twenty-one years, or an agreement for such a lease, made by a mortgagor on and after that day was made good and binding on the mortgagee. Power was, however, given by that Act to exclude the operation of this provision, and in practice it was not infrequently excluded, and the old law remained in operation. It followed of course that, as there was no contract between the tenant and the mortgagee, the mortgagee, on the one hand, had no remedy against the tenant under the covenants or agreements in the contract of tenancy, and, on the other hand, the tenant had no remedy or claim against the mortgagee. The latter was not, in fact, the tenant's landlord, and therefore the tenant had no right against him for compensation for improvements under the Agricultural Holdings Act.

In practice, as I have just said, this position was not felt to be a hardship, because, so long as the interest on the mortgage money was duly paid by the landlord (the mortgagor) to the mortgagee, it was immaterial to the latter whether the land was let or not, and even if the interest fell into arrear, the mortgagee, as a rule, was glad to receive the rent from the tenant and pay himself his interest out of it. By accepting the rent from the tenant he, in effect, adopted the contract of tenancy, and placed himself in the position of landlord, and, while reaping the benefits, rendered himself liable to the obligations incident to that position, among which latter is the obligation to pay compensation under the Holdings Act of 1883.

Some two or three years ago, however, a case arose in Yorkshire in which this usual practice appears not to have been adopted by the mortgagee of a farm, the landlord of which had let it to a tenant after he had mortgaged it, and which tenancy was not binding on the mortgagee. The landlord became bankrupt, and the mortgagee

did not adopt the tenancy ; consequently when the tenant's occupation came to an end, and he claimed and was awarded compensation for his improvements there was no one to pay him. The landlord was bankrupt and could not, and the mortgagee would not ; nor could the tenant compel the latter to do so, for, as the relationship of landlord and tenant had never been established between them, it was held by the County Court that the Act did not apply, and though an appeal to the High Court was talked of, none was ever brought.

The decision was no doubt right according to the law as it then was, and the Act of last session has been passed to prevent the recurrence of what was an undoubted hardship.

This Act enacts that when a person occupies land under a contract of tenancy with the mortgagor, whether made before or after the passing of the Act, which is not binding on the mortgagee of such land, he shall, as against the mortgagee who takes possession be entitled to any compensation which is or would, but for the mortgagee taking possession, be due to him from the mortgagor for crops, improvements, tillages, or other matter connected with the land. The sum payable for compensation may be set off against the rent or any other sum due from the tenant, and may be recovered as compensation under the Agricultural Holdings Act ; it cannot, however, be recovered personally from the mortgagee, but, as against him, can be made a charge upon the farm, just as money awarded for compensation can, in cases where the landlord is a trustee of, and not beneficially entitled to, the rent of the farm.

The Act also provides that the mortgagee shall not deprive the tenant of possession of his farm, otherwise than in accordance with the contract of tenancy, except upon giving him six months' notice of his intention to do so ; and, if the mortgagee so deprives the tenant, the tenant is entitled to compensation "for his crops and for any expenditure upon the land, which he has made in expectation of holding the land for the full time of his contract of tenancy, in so far as any improvement resulting therefrom is not exhausted at the time of his being so deprived." And this compensation is to be determined just as compensation under the Holdings Act is determined, and may be set off against rent due and charged and recovered in the way I have just mentioned, but it cannot be recovered from the mortgagee personally.

The Act, I may add in conclusion, applies to compensation under the Allotments and Cottage Gardens Compensation for Crops Act, 1887, as well as to compensation under the Agricultural Holdings Act, 1883.

S. B. L. DRUCE.

PHYSIOLOGY OF THE DOMESTICATED ANIMALS.

THE student of animal physiology—as the subject is set forth in, for example, such admirable manuals as those of Professor Huxley and Dr. Michael Foster—is continually sensible of a certain amount of difficulty in deciding to what extent any statement is generally applicable, or is more especially true of the human subject only. This difficulty is, in great part, obviated in Dr. Smith's well-printed volume¹ of nearly 1,000 pages. Dealing with a subject of high practical interest and importance, the author has, no doubt wisely, chosen to approach it solely through the scientific avenues. Accordingly, the first 160 pages are devoted to general physiology, and to that branch of it which is concerned with the physiology of animal cells. At the outset the structure of organised bodies claims attention, and this is followed by sections dealing respectively with the physics and the chemistry of the cell—this latter being regarded as the structural unit. The key to many abstruse problems, which, nevertheless, are constantly claiming the attention of the agricultural reader, will be found in this introductory portion.

The second part of the work, dealing with special physiology, extends over 740 pages, few of which do not possess some direct interest for the breeder and feeder of live-stock. It embraces the following fifteen sections :—(1) Foods ; (2) digestion ; (3) absorption ; (4) the chyle ; (5) the lymph ; (6) the blood ; (7) the circulation of the blood ; (8) respiration ; (9) the mammary secretion ; (10) the renal secretion ; (11) the cutaneous functions ; (12) nutrition ; (13) animal heat ; (14) the physiology of movement ; (15) the physiology of the nervous system.

The practically important subject of digestion is amply treated, the course of the food being traced through the mouth, œsophagus, stomach, small intestine and large intestine, and the sources and properties of the several digestive juices—the saliva, the gastric juice, the pancreatic juice, the bile, &c.—being detailed at considerable length. The chapter on the comparative digestibility of different food-stuffs is specially deserving of the attention of stock-feeders. It is false economy to pass through the alimentary canal of an animal any digestible food which, for some reason, escapes digestion. In many cases, especially in the food of cattle and sheep, the nutritive principles are contained in resisting envelopes which are impermeable to the digestive secretions, and which require mechanical reduction before they can be rendered accessible to the act of digestion. Imperfect mastication, therefore, to whatever cause it may be due, will diminish the digestibility of food. By this term, digestibility of food, is meant the amount of any food-stuff which,

¹ *The Physiology of the Domestic Animals.* By Robert Meade Smith, A.M., M.D. (F. A. Davis, Philadelphia and London, 1889.)

through digestion, is rendered capable of absorption and does actually enter the blood, in proportion to the amount which remains undigested, or which is not so absorbed. This percentage is known as the *co-efficient of digestion*, and varies according to the composition of the food and to the mode of digestion of different classes of animals. The principles thus briefly enunciated are well illustrated by numerous examples, drawn from farm animals and their food.

Before the food, which is the basis of nutrition, can become really serviceable in the nourishment of the higher animals, its ingredients must become incorporated with, and submitted to the action of, the blood. Absorption is the means whereby nutritive and other matters enter the blood; digestion is the preparation of the food for absorption, and different modes of such preparation are respectively necessary for albuminoids, for carbo-hydrates, and for fats. The blood is the medium whereby the various parts of the body are nourished, for by means of its circulation it is the carrier to and from all the organs.

An interesting section of the work is included in the twenty-six pages dealing with the mammary secretion. The respective origins of the fat, the casein, and the sugar of the blood are discussed at some length. The author regards the secretion of milk 'as a process of moulting' of the epithelial cells of the mammary gland, which undergo decomposition, and discharge the resulting products into the excretory ducts.

The food required by horses, cattle, sheep, and swine under different conditions is shown by means of numerical tables indicating for every kilogramme of body-weight the quantities of the digestible food-stuffs which should be contained in the daily ration. As regards the duration of the interval between meals, too frequent feeding is discountenanced, as it would shorten the pauses which are necessary between the digestive processes. On the other hand, if the intervals between feeding be too long, the great increase of hunger which results leads to faulty mastication, and imperfect insalivation of the food.

The chapter on the physiology of movement will be studied with much interest by all who would rightly understand the mechanisms which underlie what is termed 'action' in the horse. The subject is made the more attractive by the reproduction of Colin's illustrations portraying the oscillations of the limbs, and of Muybridge's plates showing the successive movements which respectively enter into walking, ambling, pacing, trotting, cantering, and running. Another apt illustration shows the resultant of the propelling forces which are called into play when a horse is hauling from the collar.

The physiology of the nervous system is less thoroughly treated than might have been expected—that is, in so far as the domesticated animals are concerned. There may be noticed a tendency, on the one hand, to branch off into psychological details, and, on the other, to tacitly assume that certain facts pertaining to man are equally applicable to farm animals. But, granting the difficulties with which the study of nerve functions is surrounded, there can be little excuse for giving one anatomical description of the eye as serving

for all the animals under consideration. The eye is an organ of extreme interest and importance in the horse, but the description given is—although this does not appear to be specified—obviously that of the human eye. It is, in fact, supplied with only four rectus muscles, which is correct as regards the eye of man; of the fifth, or posterior, rectus muscle, so-called, of the horse's eye there is no mention.

The third and concluding part of the volume, dealing with the reproductive functions, though restricted to twenty pages, is well written, and embodies as clear an account of the subject as is, perhaps, to be found in any physiological work. The series of changes between impregnation and parturition does not come under discussion, as this appertains more particularly to the subject of embryology.

The fact that the book is of American origin, the author being Professor of Comparative Physiology in the University of Pennsylvania, will serve to explain the use of certain terms and phrases scarcely current in Britain. The English farmer will not at the outset identify "fodder beets" with his own familiar mangel; still less will he recognise sainfoin under the author's name—taken from the French—of *esparcet*.

A word of approbation is called for regarding the upwards of 400 illustrations, some of them coloured. It is true they are not original, but it is doubtful if the great majority of them do not for the first time make their appearance in a work which is well qualified to become popular in the ordinary acceptation of the term. The illustrations are throughout acknowledged to their authors, the names of whom are a guarantee of the correctness and reliability of their work.

The coloured illustrations are a characteristic feature of the volume, inasmuch as they are introduced without the aid of plates. They are particularly well adapted to show the varying appearances presented by glands in their alternating periods of rest and activity. Amongst the structures thus delineated are the parotid gland, which is the largest of the glands whose function it is to pour saliva into the mouth; the glands of the stomach, which secrete the gastric juice; and the pancreas, or sweetbread, a large gland slung up in a flap of the covering membrane of the stomach, and discharging an important digestive juice into the intestine.

What, years ago, Chauveau accomplished in popularising the anatomy of the domesticated animals, Dr. Meade Smith may now claim to have done in connection with their physiology. Produced avowedly as a text-book for veterinary and medical students and practitioners, this volume may confidently appeal to a still wider field of readers amongst agriculturists. Stock-breeders and stock-feeders who study its pages will do so with interest and profit.

RECENT AGRICULTURAL INVENTIONS.

*The subjects of Applications for Patents from Sept. 1 to
Dec. 13, 1890.*

N.B. Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application	Name of Applicant	Title of Invention
13815	BAMBER, J.	• Weighing and moving trusses of hay.
13825	BAMFORD, S. B.	• Mowing and reaping machines.
13923	BRAITHWAITE, C. H.	• Lawn mowers.
14095	MOORE, J.	• Reaping and mowing machines.
14216	YATES, and another	• Machines for digging potatoes.
14376	MUMFORD, & HEARN	• Cleaning meal-powder, seed, &c.
14443	DICKIE, W.	• Hayrack lifters, &c.
14530	RUSSELL and others	• Ploughshare.
14772	HORNSBY and others	• Knotting apparatus of harvesting machines.
14773	"	• Harvesting machines.
14936	DOUGLAS, A.	• Reaping machines.
14986	BROOKFIELD & anr.	• Separating dust from chaff, corn, &c.
15082	BAGG, A. E.	• Combined rake and weed eradicator.
15157	BALL, J.	• Scythes.
15242	SARGEANT, T. C.	• Drills.
15897	STONE, R.	• Pulverisers or cultivators
16090	BYCE, A. C.	• Potato-digging machine.
16492	WOODVILLE, G.	• Machine for pressing and trussing hay, &c.
16496	WILKINS and BIGGE	• Combined rake and elevator.
16618	DELEGLISE-POUILLY	• Cleaning grain, &c.
16806	BROWN, J. E.	• Draining land.
16891	ARNOLD, J. J.	• Showing market weight of corn in bulk from a sample thereof.
16933	D'ALNOY, E. Z.	• Implement for binding fodder.
16944	GOHM, J.	• Potato-digger.
17015	HARRIS, H.	• Horse-hoes.
17368	WESTAWAY, J.	• Machine for forcing down further into the earth roots of young growing corn, &c.
17629	BOULT, J. (<i>Harris</i>)	• Mowers.
17764	CLARKSON, J.	• Cutter bar and knife of mowers and reapers.
17768	DOUGLAS, A.	• Reaping and mowing machines.
17789	HARDING, T. R.	• Ploughs.
17927	GULPIN, T.	• Sickle-heads, &c., of mowing machines.
18183	MONROE, H. H.	• Rotary harrows.
18778	LINAKER and anr.	• Machine for ploughing, harrowing, &c., land.
19198	HIRSCHLER, S.	• Detaching, &c., acrospires from malt.
19325	FAIRWEATHER, J.	• Topping, tailing, and lifting turnips.
19410	DARBY & STEEVENSON	• Implement for cultivating land.
19574	WINSON, W.	• Chaff-cutters.
19793	FERNET-WAUTHIER	• Distributing manure, &c., on land.
19889	MCLAREN, J. P.	• Potato-diggers.
19913	PERKINS, J. E. S.	• Pressing hay, &c.
20310	STONE, R.	• Artificial manure.
20387	BAYLEY (<i>Clugage</i>)	• Harvesters.

Stable Utensils and Fittings—Horse-shoes, &c.

No. of Application	Name of Applicant	Title of Invention
13778	SAYLE, R. G.	Horse-tail holders.
14056	SCATTERGOOD, G.	Horse-shoes.
14123	BUTTERFIELD, & anr.	"
14215	LEA, C.	"
14871	DROUGHT, J. T.	Pneumatic harness.
15014	BOYES, T.	Roughing horse-shoes.
15375	WITLEY, G. S.	Horse-shoes.
15376	CHESTER, C.	Calk for horse-shoes.
15437	MAY, F.	Sanitary nose-bag.
15528	BROWN, C. L.	Rasp for horses' feet.
15558	MARSHALL, J. B.	Hame tugs.
15628	D'AMILLY and CAILLET	Horse-shoes.
15679	LANE and COLLS	"
15700	GOVAN, A. A.	Horse-bits.
15732	TEMPLE, T.	Horse-collars.
15879	BLACKFORD, E. O.	Cart saddles.
15935	WILLIAMS, D.	Stopping horses from bolting.
16239	PARTRIDGE, J.	Stirrups.
16300	COX, J. S.	"
16310	BARWORTH and LOADS.	Tubular air-pads for horse-collars, &c.
16733	SKEERITT and WILCOCK	Horse-shoes.
16753	BRASSEUR and MALLET	Trees for riding saddles.
16764	BOTTRILL, H. J.	Portable horse-shoe rougher.
17174	LEE, L. S.	Preventing horses' hoofs striking.
17291	WELLS, A. E.	Nose-bags.
17359	OFFORD, T.	Horses' elbow-pad.
17632	BOULT (<i>Irvine and anr.</i>)	Horse-collars.
17877	GARDNER (<i>Brettonneaus</i>).	Nose-bags.
17907	PENDLEBURY and anr.	Harness tugs.
17911	SHEATHER, C.	Pneumatic horse-shoe pad.
18041	HUBAND, T. A.	Horse-shoe to prevent slipping.
18098	GOZZETT, C. C.	Ointment for horses' hoofs.
18586	HEYS, W. E. (<i>Martinot</i>)	Knee-caps for horses.
18781	BLACKBOURN, J.	Nailless horse-shoe.
19623	WESTAWAY & SIMMONS	Saddles and girths.
19663	LAKE (<i>Covell</i>)	Device for attaching horse-shoes.
19799	BICLEFELD, J. M.	Nose-bags.
19843	ISBISTER, J.	Wooden-bodied horse-collar.
19965	JACOBS and LUCIEN	Stopping runaway horses.
19971	LEA, C.	Horse-shoes.
20065	SHAW, S.	Saddles.

Carts and Carriages.

13928	KNIGHT, A. W.	Steps of carriages.
13974	PRIME, and another	Suspending carriage-bodies.
14247	DAWSON, W. B.	Seats of dog-carts, &c.
14504	MAGILL, T. S.	Carriages, &c.
14856	JAMES, W. H.	Carriage-brake.
16652	HARPER, F. A.	Self-adjusting arrangement for two-wheeled carriages.
17004	HENRARD, A. F.	Utilising the efforts of teams of two or more horses abreast.
17638	WALKER, E. F.	Pneumatic tyres to prevent side slipping.
19170	WYATT, B.	Cart and root-cutter combined.
19412	HILL, T.	Wagons.
20060	ROGERS and SONS	Automaton front and hind Dog-cart seats.

Dairy Utensils, &c.

No. of Application	Name of Applicant	Title of Invention
13715	HOSKINS, C.	Apparatus for washing butter.
13912	ALLEN, O. J.	Packing cheese for exportation.
13935	PETT, J. H.	Churn.
13973	HANSEN, T. and anr.	Churns, &c.
14495	AMIES, T. A.	Hoop and bottom for railway milk cans.
15172	PETT, J. H.	Butter press.
15420	WATSON, L.	Milk churn.
16454	BONNÉ, C. R.	Churn.
17144	HAUSER, S.	Butter churns.
17526	THOMPSON (<i>Ahlborn</i>)	Butter-worker.
18745	COLE, W.	Production of butter.

Poultry and Game, &c., Appliances.

14261	GLOVER, C. E.	Incubators.
14417	WYLAM, E.	Food for game and poultry.
14884	FREETH and POCOCK	Packing cases for eggs.
15271	LEVICK, O. K.	Incubators.
15823	MORSE, J.	Incubator and rearing appliance.
16146	LATHBURY, C. J.	Model incubator.
17966	CASHMORE, C.	Rearing and brooding chickens.
18831	MANN, S.	Heat regulator for incubators.

Miscellaneous.

14208	PEACHE, J. C.	Shearing sheep, &c.
14371	ANDREWS, L., and anr.	Clippers or shears for animals.
14417	WYLAM, E.	Food for animals.
14510	MUIRHEAD, W. M.	Drinking troughs for cattle, &c.
15137	SEAMAN, A. R.	Honey extractors.
15307	JULL, J. W.	Food for dogs.
16068	BOON, N.	Dipping and lifting sheep by complex circular motion.
16195	BLACKIE and NISBET	Sheep-shearing machine.
16318	CANK, T.	Alarm guns for game preserves.
17660	WRIGHT and others	Beehive frames and fittings.
17959	HORLYCK, H.	Milking machine.
18071	ROWLANDS, D.	Ear-marking sheep.
18552	COOKE, F. I.	Preventing access of rats, &c., to stacks.
18765	EVERY, W. B.	Steelyards and cattle-weighting machines.
18812	SCOTT, E. L.	Cure for distemper in dogs.
19008	NASH, R. G.	Device to indicate ownership of cattle.
19614	NEWALL, J. W.	Machine for clipping hair and wool.
19760	RUCKER and ALLBUTT.	Drawing docks, &c., from lawns.
19812	HOYT, D. A.	Lawn sprinklers.
20304	WOODHOUSE & RAWSON Limited	Cattle-branding apparatus.

Numbers of Specifications relating to the above subjects Published since September 1¹

(with prices in parentheses).

238 (8*d.*), 368 (8*d.*), 1511 (6*d.*), 1835 (6*d.*), 2574 (8*d.*), 4380 (8*d.*), 4857 (8*d.*), 6313 (6*d.*), 6576 (8*d.*), 6911 (8*d.*), 8048 (8*d.*), 8263 (8*d.*), 11341 (6*d.*), 11467 (8*d.*), 11621 (8*d.*), 11744 (6*d.*), 11852 (6*d.*), 11874 (6*d.*), 12236 (6*d.*), 12441 (6*d.*), 12479 (6*d.*), 12505 (11*d.*), 12555 (4*d.*), 12955 (4*d.*), 13778 (6*d.*), 14971 (6*d.*), 15137 (6*d.*), 15879 (8*d.*), 1090 (8*d.*), 1175 (8*d.*), 2651 (6*d.*), 3736 (6*d.*), 11903 (6*d.*), 13923 (8*d.*).

¹ Copies may be obtained at the Patent Office (Sale and Store Branch) 38 Cursitor Street, London, E.C.

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

A summary of the Agricultural Returns of Great Britain, 1890, is given in Tables I. and II. on this and the following pages.

TABLE I.—*Acreage under each kind of Crop, Bare Fallow, and Grass as returned upon June 4 in the Years 1890 and 1889 in Great Britain; with Total for the United Kingdom.*

		GREAT BRITAIN		UNITED KINGDOM, including ISLE OF MAN and CHANNEL ISLANDS	
		1890	1889	1890	1889
		acres	acres	acres	acres
TOTAL AREA OF LAND AND WATER		50,786,199	50,786,199	77,799,793	77,799,793
TOTAL ACREAGE under ALL KINDS of CROPS, BARE FALLOW, and GRASS (a)		32,708,335	32,733,357	48,045,755	47,931,165
CORN CROPS.	Wheat	2,386,336	2,449,354	2,483,595	2,544,549
	Barley or Bere	2,111,178	2,121,530	2,300,994	2,316,044
	Oats	2,902,998	2,888,704	4,137,790	4,140,563
	Rye	54,826	69,438	69,458	85,281
	Beans	358,412	321,220	362,242	335,191
	Peas	219,382	224,926	220,170	225,726
	TOTAL	8,032,132	8,075,172	9,574,249	9,637,354
GREEN CROPS.	Potatoes	529,661	579,222	1,321,272	1,377,451
	Turnips and Swedes	1,947,598	1,920,241	2,251,220	2,226,754
	Mangel	351,268	326,126	378,313	370,654
	Carrots	14,926	15,736	18,417	19,217
	Cabbage, Kohl Babi, & Rape	159,761	147,091	213,165	196,637
	Other Green Crops	314,294	310,829	351,758	351,067
	TOTAL	3,397,528	3,299,647	4,534,145	4,541,700
CLOVER, SAINFOIN, and GLASSES under Rotation.	For Hay	2,292,194	2,476,734	2,938,680	3,162,062
	Not for Hay	2,516,625	2,400,564	3,158,530	3,026,440
	TOTAL	4,808,819	4,877,298	6,097,210	6,188,502
PERMANENT PASTURE or GRASS, Not broken up in Rotation. (b)	For Hay	4,778,629	4,987,486	6,246,352	6,512,730
	Not for Hay	11,388,853	10,878,877	20,867,072	20,303,362
	TOTAL	16,017,492	15,866,363	27,113,425	26,816,092
FLAX		2,455	2,375	99,326	116,192
HOPS		54,555	57,749	54,555	57,749
SMALL FRUIT (c)		46,234	41,933	(d) 40,733	(d) 42,508
BARE FALLOW or Uncropped Arable Land		508,119	518,520	524,112	551,010

(a) Not including nursery grounds and woods.

(b) Exclusive of heath and mountain land.

(c) Gooseberries, strawberries, and other small fruit, including what is grown between trees in orchards, and also in market gardens.

(d) Not including Ireland.

TABLE II.—*Number of Horses, Cattle, Sheep, and Pigs as returned upon June 4 in the Years 1890 and 1889 in Great Britain; with Total for the United Kingdom.*

		GREAT BRITAIN		UNITED KINGDOM, including ISLE OF MAN and CHANNEL ISLANDS	
		1890	1889	1890	1889
HORSES (e)	Used solely for Agriculture	No. 981,275	No. 981,753	No. (g) —	No. (g) —
	Unbroken Horses	303,915	327,895	(g) —	(g) —
	Mares kept solely for breeding	57,430	52,241	(g) —	(g) —
	TOTAL	1,432,620	1,421,389	1,964,911	1,945,886
CATTLE	Cows and Heifers in Milk or in Calf	2,537,990	2,433,639	3,956,220	3,814,593
	Other { 2 Years and above	1,439,119	1,453,859	2,361,424	2,389,501
	Cattle. { Under 2 Years	2,581,523	2,262,067	4,472,214	4,088,671
	TOTAL	6,558,632	6,150,555	10,789,858	10,272,765
SHEEP.	1 Year old and above	16,755,588	15,862,132	19,382,472	18,148,352
	Under 1 Year old	10,515,891	9,769,888	12,334,723	11,336,422
	TOTAL	27,272,459	25,632,020	31,667,196	29,484,774
Pigs (f)		2,773,809	2,510,803	4,362,040	3,905,865

(e) As returned by Occupiers of Land.—Including Ponies.

(f) With the exception of those for Ireland, the numbers of Pigs are exclusive of those kept in towns, and by cottagers with less than a quarter of an acre of land.

(g) Cannot be separately distinguished for the United Kingdom.

Land occupied by Owners or Tenants.—The statistics collected show that, although the changes are not uniform in direction, there is a very slight decrease of the entire percentage of land this year in the hands of owners (14·78 against 14·82) compared with the figures for 1889. For Great Britain as a whole, the cultivated surface—which in the Returns excludes all woods and mountain and heath land—recorded as farmed by its owners, is 4,843,000 acres against 4,852,000 acres last year, while that accounted for as in the hands of tenants is 27,925,000 against 27,881,000. The general decrease of owner-farmed land which distinguishes the country as a whole appears to be relatively more marked in Scotland than in England, while in the Welsh counties generally an opposite tendency appears, and there is rather more land on the owners' hands than there was before.

Arable and Pasture Area.—A material and nearly continuous shrinkage of the land under the plough has now been in progress for the last 18 years, accompanied by a continuous and still larger extension of the recorded Grass area, but the Arable area is still the greater of the two, if Great Britain be regarded as a whole. This is not quite the case if the English figures be viewed by themselves (Table III., page 887).

TABLE III.—*Arable and Pasture Areas.*

Years	England (only)		Total for Great Britain	
	Arable	Pasture	Arable	Pasture
	acres	acres	acres	acres
1870	18,729,000	9,680,000	18,335,000	12,073,000
1880	18,184,000	11,462,000	17,675,000	14,427,000
1890	12,172,000	12,836,000	16,751,000	16,017,000

The 4,000,000 acres added in 20 years to the Pasture of Great Britain is thus not wholly due to the laying down of Arable Land to Grass. Compared with 1889, the Arable Land of Great Britain in 1890 is less by 117,000 acres, and the Pasture greater by 152,000 acres, nearly the whole change taking place in England.

Live Stock.—Table IV. shows the numbers of horses, cattle, sheep, and pigs in Great Britain in 1870, 1880, and 1890.

TABLE IV.—*Number of Live Stock in Great Britain in 1870, 1880, and 1890.*

Years	Horses	Cattle	Sheep	Pigs
	No.	No.	No.	No.
1870	1,267,000	5,403,000	28,398,000	2,171,000
1880	1,421,000	5,912,000	26,619,000	2,001,000
1890	1,433,000	6,509,000	27,272,000	2,774,000

Table showing the Estimated Total Production of Hops in the Years 1890 and 1889, with the Acreage and Estimated Average Yield per Statute Acre, in each County in England in which Hops were grown.

COUNTIES	Estimated total produce		Acreage		Estimated average yield per acre	
	1890	1889	1890	1889	1890	1889
	Cwt.	Cwt.	Acres	Acres	Cwt.	Cwt.
Berks	58	62	11	10	5·27	6·20
Gloucester	22	—	14	4	1·57	—
Hants	19,104	19,154	2,614	2,905	7·31	6·59
Hereford	24,129	36,811	6,519	6,850	3·70	5·37
Kent	175,008	331,656	33,525	35,437	5·22	9·35
Notts	29	60	14	16	2·07	3·75
Salop	378	724	110	101	3·44	7·17
Suffolk	13	239	25	29	0·52	8·24
Surrey	9,025	16,410	1,874	2,101	4·82	7·81
Sussex	43,599	73,028	6,787	7,382	6·42	10·03
Worcester	14,424	19,667	3,058	2,939	4·72	6·69
Total	285,789	497,811	54,551	57,724	5·24	8·62

NOTE.—As the above Preliminary Estimate is issued at the earliest possible moment after receipt of the particulars, it is necessarily subject to correction in the Annual Produce Statistics.

¹ Ground newly planted. No yield.

² This acreage does not quite agree with that given in the Return of Acreage under hops previously published, owing to four acres having been originally returned in error.

Summary of Agricultural Produce Statistics (Wheat, Barley, and Oats) in England, Wales, Scotland, and Great Britain, for 1890.

WHEAT

	Estimated Total Produce		Acreage		Estimated average Yield per Acre	
	1890	1889	1890	1889	1890	1889
	bushels	bushels	acres	acres	bushels	bushels
England . . .	69,442,417	69,336,374	2,255,694	2,321,504	30.79	29.87
Wales . . .	1,712,541	1,672,557	68,669	68,464	24.94	24.43
Scotland . . .	2,199,526	2,193,842	61,973	59,386	35.49	36.94
Great Britain . .	73,354,484	73,202,773	2,386,336	2,449,354	30.74	29.89

BARLEY

	Estimated Total Produce		Acreage		Estimated average Yield per Acre	
	1890	1889	1890	1889	1890	1889
	bushels	bushels	acres	acres	bushels	bushels
England . . .	62,250,366	56,036,582	1,775,606	1,776,011	35.06	31.55
Wales . . .	3,621,793	3,548,138	119,780	122,051	30.24	29.07
Scotland . . .	8,061,642	7,842,034	215,792	223,468	37.36	35.09
Great Britain . .	73,933,801	67,426,754	2,111,178	2,121,530	35.02	31.76

OATS

	Estimated Total Produce		Acreage		Estimated average Yield per Acre	
	1890	1889	1890	1889	1890	1889
	bushels	bushels	acres	acres	bushels	bushels
England . . .	72,104,031	68,109,136	1,648,153	1,623,967	43.75	41.94
Wales . . .	8,116,344	8,180,208	241,199	249,022	33.65	33.73
Scotland . . .	38,987,668	37,182,053	1,013,646	1,015,715	38.43	36.61
Great Britain . .	120,188,046	113,441,397	2,902,998	2,888,704	41.40	39.27

Royal Agricultural Society of England

(Established May 9, 1838, as the ENGLISH AGRICULTURAL SOCIETY, and Incorporated by Royal Charter on March 26, 1840.)

Patron.

(Letter from Secretary of State, dated March 6, 1840.)

HER MOST GRACIOUS MAJESTY THE QUEEN.

President for 1889—1890.

LORD MORETON.

Trustees.

Year when elected on Council	
1879	H.R.H. THE PRINCE OF WALES, K.G., <i>Marlborough House, Pall Mall.</i>
1838-40 } 1855	ACLAND, Rt. Hon. Sir THOMAS DYKE, Bart., <i>Killerton, Exeter, Devonshire.</i>
1873	BEDFORD, Duke of, K.G., <i>Woburn Abbey, Bedfordshire.</i>
1858	BRIDPORT, Genl. Viscount, K.C.B., <i>Cricket St. Thomas, Chard, Somerset.</i>
1861	CATHCART, Earl, <i>Thornton-le-Street, Thirsk, Yorkshire.</i>
1861	DENT, JOHN DENT, <i>Ribston Hall, Wetherby, Yorkshire.</i>
1871	EGERTON OF TATTON, Lord, <i>Tatton Park, Knutsford, Cheshire.</i>
1863	KINGSNOTE, Col. Sir NIGEL, K.C.B., <i>Kingsnote, Wotton-under-Edge, Gloucestershire.</i>
1854-59 } 1862 } 1856	MACDONALD, Sir ARCHIBALD K., Bart., <i>Woolmer Lodge, Liphook, Hants.</i>
	POWIS, Earl of, <i>Powis Castle, Welshpool, Montgomeryshire.</i>
1852-57 } 1866	RICHMOND AND GORDON, Duke of, K.G., <i>Goodwood, Chichester, Sussex.</i>
1869	RID , Sir M. W., Bart., M.P., <i>Blagdon, Cramlington, Northumberland.</i>

Vice-Presidents.

1872-74 } 1884	CHAPLIN, Rt. Hon. HENRY, M.P., <i>Blankney Hall, Lincoln.</i>
1867	DEVONSHIRE, Duke of, K.G., <i>Holker Hall, Lancashire.</i>
1876	FEVERSHAM, Earl of, <i>Duncombe Park, Helmsley, Yorkshire.</i>
1881	GILBEY, WALTER, <i>Elkenham Hall, Essex.</i>
1872	LATHOM, Earl of, <i>Lathom Hall, Ormskirk, Lancashire.</i>
1848	LAWES, Sir JOHN BENNET, Bart., <i>Rothamsted, St. Albans, Herts.</i>
1865	LOPES, Rt. Hon. Sir MASSEY, Bart., <i>Maristow, Roborough, S. Devon.</i>
1880	MORETON, Lord, <i>Tortworth Court, Fulfield R.S.D., Gloucestershire.</i>
1867	RAVENSWORTH, Earl of, <i>Ravensworth Castle, Gateshead, Durham.</i>
1874	SPENCER, Earl, K.G., <i>Althorp, Northampton.</i>
1881	THOROLD, Sir JOHN H., Bart., <i>Syston Park, Grantham, Lincolnshire.</i>
1869	WHITEHEAD, CHARLES, <i>Barming House, Maidstone, Kent.</i>

List of Council of the Society.

Other Members of Council.

Year when elected on Council.	
1889	H. R. H. Prince CHRISTIAN, K.G., <i>Cumberland Lodge, Windsor.</i>
1881	ALLENDER, G. MANDER, 31 <i>St. Petersburg Place, Bayswater, Middlesex.</i>
1862-66 1877	* ARKWRIGHT, J. HUNGERFORD, <i>Hampton Court, Leominster, Herefordshire.</i>
1880	ASHWORTH, ALFRED, <i>Tabley Grange, Knutsford, Cheshire.</i>
1871	BOWEN-JONES, J., <i>Ensdon House, Montford Bridge, Salop.</i>
1885	CAIRD, JAMES A., <i>Northbrook, Micheldever, Hants.</i>
1874	CHANDOS-POLE-GELL, H., <i>Hopton Hall, Wirksworth, Derbyshire.</i>
1883	* CLAY, CHARLES, <i>Walton Grange, Wakefield, Yorkshire.</i>
1885	COVENTRY, Earl of, <i>Croome Court, Seconr Stoke, Worcestershire.</i>
1887	CRUTCHLEY, PERCY E., <i>Summinghill Park, Ascot, Berkshire.</i>
1888	DARBY, ALFRED, <i>Little Ness, Shrewsbury, Shropshire.</i>
1885	DE LAUNE, C. DE L. FAUNCE, <i>Sharsted Court, Sittingbourne, Kent.</i>
1882	* EMLYN, Viscount, <i>Golden Grove, Carmarthen, S. Wales.</i>
1879	* FOSTER, S. P., <i>Killhow, Carlisle, Cumberland.</i>
1875	* FRANKISH, WILLIAM, <i>Limber, Ulceby, Lincolnshire.</i>
1879	GORRINGE, HUGH, <i>Kingston-by-Sea, Brighton, Sussex.</i>
1879	* GRENVILLE, R. NEVILLE, <i>Butleigh Court, Glastonbury, Somersetshire.</i>
1889	HAMOND, ANTHONY, <i>Westacre, Swaffham, Norfolk.</i>
1888	* HORNEBY, JAMES, <i>Stapleford Park, Melton Mowbray, Leicestershire.</i>
1876	HOWARD, CHARLES, <i>Biddenham, Bedfordshire.</i>
1883	* JERSBY, Earl of, <i>Middleton Park, Bicester, Oxfordshire.</i>
1886	MAINWARING, C. S., <i>Galltfaenan, Trefnant R.S.O., North Wales.</i>
1874	MARTIN, JOSEPH, <i>Highfield House, Littleport, Isle of Ely, Cambs.</i>
1884	MILLER, T. HORROCKS, <i>Singleton Park, Poulton-le-Fylde, Lancashire.</i>
1886	* MUNTZ, PHILIP ALBERT, M.P., <i>Dunsmore, Rugby, Warwickshire.</i>
1881	PARKER, Hon. Cecil T., <i>Eccleston, Chester.</i>
1886	PELL, ALBERT, <i>Hazelbeach, Northampton.</i>
1889	* PIDGEON, DANIEL, <i>Walsingham House, Piccadilly, W.</i>
1888	* PORTLAND, Duke of, <i>Welbeck Abbey, Worksop, Notts.</i>
1886	* RANSOME, J. E., <i>Holme Wood, Ipswich, Suffolk.</i>
1871	* RAWLENCE, JAMES, <i>Bulbridge, Wilton, Salisbury, Wilts.</i>
1889	ROWLANDSON, SAMUEL, <i>Newton Morrell, Darlington (Yorkshire)</i>
1874	* SANDAY, GEORGE H., <i>Langdale Lodge, Clapham Park, Surrey.</i>
1886	SCARTH, W. T., <i>Staindrop House, Darlington, Durham.</i>
1878	* SHERATON, WILLIAM, <i>Lynnhill, Wem, Salop.</i>
1886	SMITH, ALFRED J., <i>Rendlesham, Woodbridge, Suffolk.</i>
1889	* SMITH, HENRY, <i>The Grove, Cropwell Butler, near Nottingham.</i>
1889	* SPEARMAN, Sir J. L. E., Bart., <i>Llansannor Court, Conbridge, Glam.</i>
1882	* STAFFORD, Marquis of, <i>Lilleshall, Newport, Salop.</i>
1875	* STRATTON, RICHARD, <i>The Duffryn, Newport, Monmouthshire.</i>
1883	* SUTTON, MARTIN J., <i>Kidmore Grange, Caversham, Oxon.</i>
1889	* TAVISTOCK, Marquis of, <i>Endsleigh, Tavistock, Devonshire.</i>
1869	TAYLOR, GARRETT, <i>Trowse House, Norwich.</i>
1889	* TREMAYNE, JOHN, <i>Heligan, St. Austell, Cornwall.</i>
1882	* WARREN, REGINALD AUGUSTUS, <i>Preston Place, Worthing, Sussex.</i>
1889	* WHEELER, E. VINCENT V., <i>Nemham Ct., Tenbury, Worcestershire.</i>
1889	WILSON, C. W., <i>Rigmaden Park, Kirkby Lonsdale, Westmoreland.</i>
1865	WILSON, Sir JACOB, <i>Ohillingham Barns, Belford, Northumberland.</i>

* Members of Council who retire by rotation, but may be re-elected.

STANDING COMMITTEES FOR 1890.

* * The PRESIDENT is a Member *ex officio* of all Committees, and the TRUSTEES and VICE-PRESIDENTS are Members *ex officio* of all Standing Committees except the Committee of Selection.

Finance Committee.

KINGSCOTE, Col. Sir NIGEL (Chairman).	THOROLD, Sir J. H., Bt.
BRIDPORT, General Viscount.	FRANKISH, W.
RIDLEY, Sir M. WHITE, Bt., M.P.	SANDAY, G. H.

House Committee.

CHAIRMAN of Finance Committee.	PARKER, Hon. C. T.
THE PRESIDENT.	WILSON, Sir JACOB.
BRIDPORT, General Viscount.	ALLENDER, G. M.

Journal Committee.

CATHCART, Earl (Chairman).	FRANKISH, W.
EMLYN, Viscount.	PELL, A.
THOROLD, Sir J. H., Bt.	PIDGEEON, D.
ASHWORTH, A.	SUTTON, MARTIN J.
CAIRD, J. A.	WHITEHEAD, CHARLES.
DE LAUNE, C. DE L. FAUNCE.	DENT, J. D.

Chemical Committee.

EMLYN, Viscount (Chairman).	SPEARMAN, Sir J. L. E., Bt.	GRENVILLE, R. N.
BEDFORD, Duke of.	THOROLD, Sir J. H., Bt.	HOWARD, C.
TAVISTOCK, Marquis of.	ARKWRIGHT, J. H.	PELL, A.
PARKER, Hon. C. T.	BOWEN-JONES, J.	TREMAINE, J.
ACLAND, Sir T. D., Bt.	CAIRD, J. A.	VOELCKER, Dr.
LAWES, Sir J. B., Bt.	DE LAUNE, C. DE L. FAUNCE.	WARREN, R. A.
MACDONALD, Sir A. K., Bt.	DENT, J. D.	WHITEHEAD, CHAS.

Seeds and Plant Diseases Committee.

WHITEHEAD, CHARLES	CAIRD, J. A.	MAINWARING, C. S.
(Chairman).	CARRUTHERS, W.	ORMEROD, Miss E. A.
THOROLD, Sir J. H., Bt.	DE LAUNE, C. DE L.	PELL, A.
ARKWRIGHT, J. H.	FAUNCE.	STRATTON, R.
BOWEN-JONES, J.	HORNSEY, J.	SUTTON, MARTIN J.

Veterinary Committee.

THOROLD, Sir J. H., Bt.	BROWN, Professor.	MASTER OF FARRIERS'
(Chairman).	CHANDOS-POLE-GELL, H.	COMPANY.
BRIDPORT, General Viscount.	CLAY, C.	MILLER, T. H.
EGERTON OF TATTON, Lord.	COPE, A. C.	PELL, A.
MORETON, Lord.	CROOKSHANK, Prof.	PRESIDENT OF ROYAL
PARKER, Hon. C. T.	DABBY, ALFRED	COLL. OF VET.
KINGSCOTE, Col. Sir NIGEL.	DENT, J. D.	SURGEONS.
WILSON, Sir JACOB.	FLEMING, Dr. GEORGE.	SIMONDS, Prof.
ALLENDER, G. M.	FOSTER, S. P.	SMITH, A. J.
ASHWORTH, A.	GORRINGE, H.	WHEELER, E. V. V.
AXE, Prof. J. WORTLEY.	HAMOND, A.	WILSON, C. W.

Stock-Prizes Committee.

SANDAY, G. H. (Chairman).	BOWEN-JONES, J.	MILLER, T. H.
H. R. H. Prince CHRISTIAN,	CHANDOS-POLE-GELL, H.	MUNTZ, P. A., M.P.
K. G.	CRUTCHLEY, P. E.	ROWLANDSON, S.
COVENTRY, Earl of.	DABBY, ALFRED.	SIMONDS, Professor.
MORETON, Lord.	FOSTER, S. P.	SMITH, A. J.
PARKER, Hon. C. T.	FRANKISH, W.	SMITH, HENRY.
SPEARMAN, Sir J. L. E., Bt.	GILBEY, WALTER.	STRATTON, R.
WILSON, Sir JACOB.	GORRINGE, H.	TAYLOR, GARRETT.
ALLENDER, G. M.	HOWARD, C.	TREMAINE, J.
ARKWRIGHT, J. H.	MAINWARING, C. S.	WILSON, C. W.
ASHWORTH, A.	MARTIN, JOSEPH.	The Stewards of Live
		Stock.

Standing Committees for 1890.

Implement Committee.

FRANKISH, W. (Chairman).	BOWEN-JONES, J.	ROWLANDSON, S.
BRIDPORT, Gen. Viscount.	CLAY, C.	SANDAY, G. H.
MORETON, Lord.	GRENVILLE, R. NEVILLE.	SERRATON, W.
PARKER, Hon. C. T.	HORNSBY, J.	SMITH, A. J.
THOROLD, Sir J. H., Bt.	HOWARD, C.	SMITH, HENRY.
WILSON, Sir JACOB.	MARTIN, JOSEPH.	STRATTON, R.
ALLENDER, G. M.	PIDGEON, D.	The Stewards of Im-
ANDERSON, W.	RANSOME, J. E.	plements.

General Plymouth Committee.

THE WHOLE COUNCIL, with the following representatives of the LOCAL COMMITTEE:—

MOUNT-EDGEUMBE, Earl of.	EAST STONEHOUSE LOCAL	PITTS, THOMAS, Jun.
MORLEY, Earl of.	BOARD, Chairman of.	PLYMOUTH, Mayor of.
DEVONPORT, Mayor of.	JOHNS, RICHARD B.	ST. AUBYN, EDWARD.

Sham-Port Works Committee.

WILSON, Sir JACOB (Chairman).	CLAY, CHARLES.	HOWARD, C.
ALLENDER, G. M.	FRANKISH, W.	SANDAY, G. H.
ASHWORTH, A.	GRENVILLE, R. NEVILLE.	STRATTON, R.
	HORNSBY, J.	

Committee of Selection.

CATCART, Earl (Chairman).	CHANDOS-POLE-GELL, H.	STRATTON, R.
CATCART, J. A.	WILSON, Sir JACOB.	WARREN, R. A.
	MAINWARING, C. S.	

And the Chairmen of the Finance, Journal, Chemical, Stock-Prizes, and Implement Committees.

Education Committee.

DENT, J. D. (Chairman).	KINGSCOTE, Col. Sir NIGEL.	RANSOME, J. E.
JERSEY, Earl of.	BOWEN-JONES, J.	TREMAINE, J.
EMLYN, Viscount.	DE LAUNE, U. DEL FAUNCE.	VOELCKER, Dr.
MORETON, Lord.	MAINWARING, C. S.	WHEELER, E. V. V.
	PELL, A.	

Bairry Committee.

PARKER, Hon. C. T. (Chairman).	THOROLD, Sir J. H., Bt.	MAINWARING, C. S.
BRIDPORT, Gen. Viscount.	ALLENDER, G. M.	SERRATON, W.
EGERTON OF TATTON, Lord.	ARKWRIGHT, J. H.	TAYLOR, GARRETT.
	ASHWORTH, A.	VOELCKER, Dr.
	DARBY, ALFRED.	

Chief Officials of the Society.

Secretary and Editor—ERNEST CLARKE, 12 Hanover Square, W.
Consulting Chemist—Dr. J. AUGUSTUS VOELCKER, 12 Hanover Square, W.
Consulting Botanist—W. CARRUTHERS, F.R.S., P.L.S., 44 Central Hill, Normood, S.E.
Consulting Entomologist—Miss E. A. ORMEROD, F.R.Met.Soc., Torrington House, Holywell Hill, St. Albans.
Consulting Veterinary Surgeon—Professor JAMES BEART SIMONDS, St. John's Villa, Bayde, Isle of Wight.
Veterinary Inspectors—THE OFFICERS OF THE ROYAL VETERINARY COLLEGE.
Consulting Engineers—Messrs. EASTON & ANDERSON, Lim., 3 Whitehall Place, S.W.
Surveyor and Superintendent of Works—WILSON BENNISON, 66 Ashley Road, Crouch Hill, London, N.
Consulting Surveyor—GEORGE HUNT, Evesham, Worcestershire.
Publisher—JOHN MURRAY, 50A Albemarle Street, W.
Bankers—THE LONDON AND WESTMINSTER BANK, St. James's Square Branch.

DISTRIBUTION OF MEMBERS OF THE COUNCIL AND OF MEMBERS OF THE SOCIETY AS AT MARCH 31, 1890.

DISTRICTS	COUNTIES	NUMBER OF MEMBERS OF SOCIETY	NUMBER OF MEMBERS OF COUNCIL	MEMBERS OF COUNCIL
A.	BEDFORDSHIRE . .	148	2	{ Duke of Bedford, K.G., T.; C. Howard.
	BUCKINGHAMSHIRE	149	—	
	CAMBRIDGESHIRE .	168	1	Joseph Martin.
	ESSEX	261	1	Walter Gilbey, v.p.
	HERTFORDSHIRE .	194	1	Sir J. B. Lawes, v.p.
	HUNTINGDONSHIRE	63	—	
	MIDDLESEX	627	2	G. M. Allender; Dan. Pidgeon.
				{ H.R.H. the Prince of Wales, K.G., T.; Anthony Hamond; Garrett Taylor.
	NORFOLK	357	3	Earl of Jersey; M. J. Sutton.
	OXFORDSHIRE . . .	167	2	J. E. Ransome; A. J. Smith.
	SUFFOLK	249	2	
		— 2383	— 14	
B.	CUMBERLAND . . .	189	1	S. P. Foster.
	DURHAM	211	2	{ Earl of Ravensworth, v.p.; W. T. Scarth.
	NORTHUMBERLAND	322	2	Sir M. White Ridley, T.; Sir Jacob Wilson.
	WESTMORELAND . .	74	1	C. W. Wilson.
		— 796	— 6	
C.	DERBYSHIRE	188	1	H. Chandos-Pole-Gell.
	LEICESTERSHIRE . .	160	1	J. Hornsby.
	LINCOLNSHIRE . . .	318	3	{ Sir J. H. Thorold, v.p.; Rt. Hon. H. Chaplin, v.p.; W. Frankish.
	NORTHAMPTONSHIRE	185	2	Earl Spencer, v.p.; A. Pall.
	NOTTINGHAMSHIRE	269	2	Duke of Portland; H. Smith.
	RUTLAND	36	—	
		— 1156	— 9	
D.	BERKSHIRE	278	2	{ H.R.H. Prince Christian, K.G.; P. E. Crutchley.
	CORNWALL	125	1	John Tremayne.
	DEVONSHIRE	181	3	{ Sir T. D. Acland, T.; Sir M. Lopes, v.p.; Marquis of Tavistock.
	DORSETSHIRE	92	—	
	HAMPSHIRE	229	2	Sir A. K. Macdonald, T.; J. A. Caird.
	KENT	463	2	C. Whitehead, v.p.; C. de L. F. De Lanne.
	SOMERSETSHIRE . . .	142	2	Visct. Bridport, T.; R. Neville Grenville.
	SURREY	304	1	G. H. Sanday.
	SUSSEX	306	3	{ Duke of Richmond and Gor- don, K.G., T.; H. Goringe; R. A. Warren.
	WILTSHIRE	158	1	J. Bawlfence.
		— 2278	— 17	
E.	YORKSHIRE	757	5	{ Earl Cathcart, T.; Earl of Faversham, v.p.; C. Clay; J. D. Dent, T.; S. Rowland- son.
			— 5	

DISTRIBUTION OF MEMBERS OF THE SOCIETY—continued.

DISTRICTS	COUNTIES	NUMBER OF MEMBERS OF SOCIETY	NUMBER OF MEMBERS OF COUNCIL	MEMBERS OF COUNCIL
F.	GLOUCESTERSHIRE .	303	2	{ Lord Moreton, P.; Col. Sir Nigel Kingscote, T.
	HEREFORDSHIRE .	158	1	{ J. H. Arkwright,
	MONMOUTHSHIRE .	47	1	{ R. Stratton.
	SHROPSHIRE . . .	439	3	{ J. Bowen-Jones; A. Darby; W. Sheraton.
	STAFFORDSHIRE .	295	1	{ Marquis of Stafford.
	WARWICKSHIRE .	239	1	{ P. A. Muntz, M.P.
	WORCESTERSHIRE .	251	2	{ Earl of Coventry; E. V. V. Wheeler.
G.	SOUTH WALES . .	174	2	{ Viscount Emlyn; Sir J. L. E. Spearman.
	CHESHIRE	346	3	{ Lord Egerton, T.; Hon. Cecil T. Parker; A. Ashworth.
	LANCASHIRE . . .	478	3	{ Duke of Devonshire, K.G., v.p.; Earl of Lathom, v.p.; T. H. Miller.
	NORTH WALES . .	243	2	{ Earl of Powis, T.; C. S. Mainwaring.
		—1906	— 13	
		—1067	— 8	
SCOTLAND		232		
IRELAND		165		
CHANNEL ISLANDS		15		
FOREIGN COUNTRIES		157		
HONORARY MEMBERS		17		
GRAND TOTAL		—10929	— 72	

HONORARY MEMBERS OF THE SOCIETY.

(“British Subjects or Foreigners who have rendered exceptional services to Agriculture or Allied Sciences,” and who have been elected under Bye-law 8 as Honorary Members, without payment of subscription.)

	Date of election as Ordinary Member	Date of election as Honorary Member
ANDERSON, William, D.C.L. M.Inst.C.E.	Aug. 2, 1871	Nov. 6, 1889
BROWN, Professor George T., C.B.	Dec. 3, 1862	May 1, 1878
CAIRD, Rt. Hon. Sir J., K.C.B.	July 2, 1851	Feb. 5, 1890
DANNFELT, Carl Juhlin	—	Feb. 1, 1871
FLEMING, George, LL.D., C.B.	—	Mar. 13, 1878
GILBERT, Dr. J. H., F.R.S.	—	July 4, 1883
HOPMAN, Dr.	—	Mar. 4, 1846
LECOUX, M. Edouard	—	April 7, 1869
PASTEUR, Mons. Louis	—	Aug. 1, 1883
PLAYFAIR, Rt. Hon. Sir Lyon, K.C.B., M.P.	—	July 6, 1842
RILEY, Prof. C. V., M.A., Ph.D.	—	Dec. 7, 1887
SANDERSON, Dr. J. Burdon	—	May 1, 1878
SCHLIEFFEN, Count	—	Dec. 12, 1883
SIMONS, Prof. J. Beart	July 25, 1838	Apr. 3, 1849
TESDORFF, Mr.	—	May 1, 1877
THIEL, Dr. H.	—	Aug. 1, 1883
TIERRELAND, Mons. Eugene	—	Aug. 1, 1883

GOVERNORS.

	Date of election as Member	Date of election as Governor
M.R.H. THE PRINCE OF WALES, K.G.... Marlborough House, Pall Mall, S.W., and Sandringham	—	Feb. 3, 1864
H.R.H. THE DUKE OF EDINBURGH, K.G.... Clarence House, St. James's, S.W.	—	Aug. 6, 1884
†H.R.H. THE DUKE OF CAMBRIDGE, K.G.... Gloucester House, Piccadilly, W.	—	Aug. 6, 1862
H.R.H. PRINCE CHRISTIAN OF SCHLESWIG-HOLSTEIN, K.G.... Cumberland Lodge, Windsor	—	Aug. 4, 1875
*ACLAND, Rt. Hon. Sir T. Dyke, Bart... Killerton, Exeter	May 29, 1838	Mar. 3, 1875
†ALDAY, William... Frickley Hall, Doncaster	—	May 5, 1847
†ALLCROFT, Herbert John... Stokesay Court, Onibury, Salop	—	Dec. 12, 1888
ALLCROFT, John D.... 108 Lancaster Gate, W.	April 2, 1862	June 29, 1870
†ARKWRIGHT, J. Hungerford... Hampton Court, Leominster	—	June 5, 1861
*BAILLIE, W. Hunter... 43 Norfolk Square, Hyde Park, W.	July 18, 1838	Mar. 5, 1890
†BATE, The Marquis of... Longleat, Warminster	—	July 6, 1853
BATHURST, Earl... Cirencester House, Gloucestershire	—	Nov. 3, 1887
*BATTEN, John... Yeovil	July 16, 1839	Mar. 5, 1890
†BEAUCHAMP, Earl... Madresfield Court, Great Malvern	—	May 5, 1875
BECTIVE, Earl of, M.P.... Underley Hall, Kirkby Lonsdale	—	July 1, 1868
†BEDFORD, The Duke of, K.G.... Woburn Abbey, Bedfordshire	—	Nov. 6, 1872
†BENN, Thomas G.... Beigny House, Newton Reigny, Penrith	Mar. 13, 1878	Aug. 2, 1882
*BIGGS, Thomas... Leicester House, Great Dover Street, S.E.	June 6, 1838	Mar. 5, 1890
BOSTEWICK, Sir Algernon, Bart., M.P.... Heath House, Hamp- stead Heath, N.W.	—	Dec. 12, 1888
BRADFORD, Earl of... Weston Park, Shifnal	Mar. 7, 1860	Mar. 3, 1875
†BRASSEY, Henry A.... Preston Hall, Aylesford	July 5, 1865	May 7, 1873
BRIDPORT, Gen. Viscount, K.C.B.... Cricket St. Thomas, Chard	Jan. 19, 1842	April 2, 1862
†BROOKS, Sir William Cunliffe, Bart.... Barlow Hall, Chorlton- cum-Hardy, Manchester	—	Aug. 7, 1872
†BROWNE, Alexander H. T.... Callaby Castle, Alnwick	—	Mar. 6, 1872
CADOGAN, Earl... Culford Hall, Bury St. Edmunds	—	Dec. 11, 1889
†CALTHEORPE, Lord... Elvetham, Winchfield	Aug. 6, 1862	June 3, 1874
*CALVERT, Frederick, Q.C.... 88 Upper Grosvenor Street, W.	Feb. 13, 1839	Mar. 5, 1890
†CATCAST, Earl... Thornton-le-Street, Thirsk	Feb. 6, 1856	April 3, 1867
CAWDOR, Earl of... Stackpole Court, Pembrokeshire	Nov. 17, 1841	Mar. 3, 1875
CHAPLIN, Rt. Hon. Henry, M.P.... Blankney Hall, Lincoln	—	Nov. 2, 1870
†CLIFFDEN, Viscount... Holdenby House, Northampton	—	July 3, 1889
†CLINTON, Lord... Heanton Satchville, Beaford, N. Devon	April 3, 1867	April 2, 1890
CLITHERBOW, Colonel Edward J. S.... Hotham Hall, Brough, Yorkshire	—	Feb. 6, 1889
*CLUTTON, John... 9 Whitehall Place, S.W.	Dec. 15, 1838	Mar. 5, 1890
†COLMAN, J. J., M.P.... Carrow House, Norwich	June 1, 1870	Feb. 6, 1889
CORNWALLIS, Fiennes S. W., M.P.... Linton Park, Maidstone	—	July 2, 1884

* Elected a Foundation Life Governor March 5, 1890.

† Life Governor.

	Date of election as Member	Date of election as Governor
COTES, Charles Cecil...Woodcote, Newport, Salop	—	Dec. 6, 1876
†COWPER, Earl...Panshanger, Hertford	—	April 7, 1875
CROOKSHANK, Prof. E. M....Saint Hill, East Grinstead	—	Nov. 6, 1889
DARNLEY, Earl of...Cobham Hall, Gravesend	—	May 5, 1852
D'AUMALE, H.R.H. The Duke...Wood Norton, Evesham	—	April 7, 1875
†DARTMOUTH, Earl of...Patahull Hall, Wolverhampton	—	Aug. 3, 1859
DE LAUNE, C. de L. Faunce...Sharsted Court, Sittingbourne	—	Nov. 6, 1878
†DENT, John Dent...Ribston Hall, Wetherby	July 2, 1851	Feb. 3, 1875
†DERBY, Earl of, K.G....Knowsley, Prescott	July 31, 1849	Mar. 5, 1890
DERWENT, Lord...Hackness Hall, Scarborough	—	April 7, 1869
*DEVONSHIRE, Duke of, K.G....Holker Hall, Grange, Lancs.	—	May 12, 1838
*DICKINSON, F. H....King's Weston, Somerset	June 27, 1838	Mar. 5, 1890
DICKSON-POYNDEY, Sir J., Bart....Hartham Park, Corsham, Wilts.	Nov. 2, 1887	April 2, 1890
*DREWITT, R. Dawtrey...Peppering House, Arundel	Mar. 11, 1840	Mar. 5, 1890
*DRUCE, Joseph...Eynsham, Oxford	May 13, 1839	Mar. 5, 1890
†DUNMORE, Earl of...Dunmore, N.B.	—	Feb. 3, 1869
†DURHAM, Earl of...Lambton Castle, Durham	—	July 14, 1880
EGERTON OF TATTON, Lord...Tatton Park, Knutsford	Mar. 6, 1872	Nov. 7, 1883
†ELLESMERE, Earl of...Worsley Hall, Manchester	—	July 7, 1869
*ELLMAN, Robert H....61 North Street, Lewes	Feb. 13, 1839	Mar. 5, 1890
*ESSEX, Earl of...Cassiobury Park, Watford	Dec. 11, 1839	Feb. 23, 1842
*EVANS, Isaac Pearson...Griff, Nuneaton	Dec. 11, 1839	Mar. 5, 1890
EVANS, Sir Thomas W., Bart. Allestree Hall, Derby	July 19, 1843	Feb. 4, 1857
EXETER, Marquis of, K.G....Burghley House, Stamford	June 5, 1867	Mar. 3, 1875
EYRE, George Bramston...Welford Park, Newbury, Berks	—	March 6, 1889
FEVERSHAM, Earl of...Duncombe Park, Helmsley	Mar. 5, 1862	Mar. 3, 1875
FIFE, Duke of, K.T....4 Cavendish Square, W.	—	Nov. 7, 1888
FITZWILLIAM, Earl, K.G....Wentworth Woodhouse, Rotherham	—	June 5, 1872
*FLETCHER, John Philip...Darby Lodge, Sunbury-on-Thames	Feb. 19, 1840	Mar. 5, 1890
†FORTESCUE, Earl...Castle Hill, South Molton	—	1861
†FREELAND, H. W....Chichester	—	May 5, 1852
†FREEMAN-MITTFORD, A.B., C.B....Bataford Park, Moreton-in-the-March, Gloucester	—	Nov. 3, 1886
†FYTCHE, J. Lewis...The Terrace, Freshwater, Isle of Wight	April 5, 1854	June 4, 1879
GILBEY, Walter...Elsenham Hall, Essex	Nov. 2, 1870	June 8, 1889
†GILL, Reginald B.E....Bickham, Roborough, S. Devon	July 2, 1884	Dec. 12, 1888
*GLOVER, John...28 Lichfield Street, Tamworth	Jan. 10, 1840	Mar. 5, 1890
GOOCH, Sir Alfred S., Bart....Benaere Hall, Wangford, Suffolk	—	July 13, 1882
GRAFTON, Duke of...Wakefield Lodge, Stoney Stratford	—	June 3, 1884
*GREAVES, William...Bakewell	Dec. 4, 1839	Mar. 5, 1490
*GREY, Earl, K.G....Howick, Lesbury, Northumberland	—	May 12, 1838
GRIFFITHS, John James...Highbury Grange, Highbury, N.	—	May 1, 1889
GWYNNE, John...Kenton Grange, The Hyde, N.W.	—	Mar. 5, 1879
†HARCOURT, E. W....Nuneham Park, Abingdon	June 3, 1868	April 2, 1890
†HAREWOOD, Earl of Harewood House, Leeds	—	Mar. 6, 1861
†HARTINGTON, Marquis of, M.P....Hardwick Hall, Chesterfield	—	June 2, 1880
HERTFORD, Marquis of...Ragley Park, Alcester	Aug. 2, 1882	May 7, 1884
†HEYWOOD, Sir T. Percival, Bart...Develeys, Utttoxeter	—	May 14, 1845
*†HOLFORD, R.S....Western Birt House, Tetbury	—	Feb. 13, 1839
†HOTSFIELD, Lord...Hothfield Place, Ashford	—	May 7, 1879

* Elected a Foundation Life Governor March 5, 1890.

† Life Governor.

	Date of election as Member	Date of election as Governor
*HOUBLON, R. Archer...Bartlow, Cambridge	Jan. 10, 1840	Mar. 5, 1890
*HULSE, Col. Sir Edward, Bt., Breamore Ho., Fordingbridge	—	June 13, 1898
JOICEY, E....Blenkinsopp Hall, Haltwhistle, Northumberland	—	Dec. 12, 1888
*KEMBLE, Horatio...108 Cromwell Road, South Kensington	July 16, 1839	Mar. 5, 1890
*KEMBLE, Thomas...Runwell Hall, Chelmsford	July 10, 1839	Mar. 5, 1890
†KINGSOTE, Col. Sir Nigel, K.C.B....Kingscote, Wotton-under-Edge, Gloucestershire	April 6, 1854	July 1, 1874
†KNIGHT, F. Winn...Wolverley House, Kidderminster	—	June 15, 1842
KOHLAPUR, H.H. The Maharajah of...Kohlapur, India	—	Feb. 6, 1889
†LATHOM, Earl of...Lathom House, Ormskirk	April 7, 1869	Nov. 6, 1872
†LAWES, Sir J. B., Bart...Rothamsted, St. Albans	April 29, 1846	Dec. 11, 1878
†LECONFIELD, Lord...Petworth House, Sussex	—	June 5, 1872
LEGH, William John...Lyme Park, Disley, Stockport	—	Aug. 4, 1858
†LEICESTER, Earl of, K.G...Holkham Hall, Norfolk	—	Nov. 15, 1843
†LEIGH, Lord...Stonesleigh Abbey, Kenilworth	—	Dec. 1, 1858
†LONDENBOROUGH, Earl of...Londesborough Pk., Market Weighton	Nov. 5, 1862	April 2, 1890
†LONDONDERY, Marquis of, K.G....Seaham Hall, Seaham Harbour, co. Durham	—	June 3, 1885
†LONSDALE, Earl of...Lowther Castle, Penrith	—	July 4, 1883
†LOPES, Rt. Hon. Sir Massey, Bart...Maristow, Roborough, Devon	Mar. 15, 1848	May 7, 1884
*LOVELACE, Earl of...East Horsley Towers, Leatherhead	—	June 26, 1838
LOYD, Lewis...Monks Orchard, Bromley	—	Mar. 1, 1865
LUCAS, Sir Thomas, Bart...Ashahead Park, Epsom	—	Dec. 12, 1888
†LUTTRELL, Col. H. A. F., C.B....Badgworth Ct., Axburgh R. S. O.	July 7, 1869	Mar. 5, 1890
*MACCLESFIELD, Earl of...Sherburn Castle, Tetsworth	Aug. 8, 1838	Mar. 5, 1890
*MACDONALD, Sir A. K., Bart...Woolmer Lodge, Liphook	July 31, 1849	Nov. 1, 1871
†MANVERS, Earl...Thoresby Park, Ollerton, Newark	—	July 2, 1873
†MAPLE, John...Bedford Lodge, Haverstock Hill, N.W.	Nov. 2, 1864	Mar. 5, 1890
†MARJORIBANKS, Rt. Hon. Edward, M.P....Ninewells, Chertside, N.B.	—	July 31, 1889
MIDDLETON, Lord...Birdsall House, York	—	Mar. 3, 1875
MILDMAY, Francis B., M.P...Flete, Ivy Bridge, Devon	—	Dec. 12, 1888
*MONCK, J. Bligh...Coley Park, Reading	May 23, 1839	Mar. 5, 1890
†MORETON, Lord...Tortworth Court, Falfield R.S.O., Glos.	—	Mar. 3, 1875
*MORRELL, F. J....St. Giles, Oxford	May 29, 1839	Mar. 5, 1890
†MORRISON, Alfred...Fonthill House, Hindon, Wilts.	—	July 3, 1861
†MOUNT-EDGUMBE, Earl of...Mount-Edgumbe, Plymouth	Nov. 6, 1861	Mar. 5, 1890
†MUNTZ, George F...Umberslade Park, Birmingham	Dec. 4, 1867	June 30, 1875
*NAME, Frederick...Luton, Selling, Faversham	Feb. 13, 1839	Mar. 5, 1890
NEELD, Sir John, Bart...Grittleton, Chippenham	—	Feb. 3, 1875
NOBEL, John...Park Place, Hemley-on-Thames	—	Nov. 7, 1883
NORMANTON, Earl of...Somerley, Ringwood, Hants.	—	Mar. 3, 1875
*NORTH, Rt. Hon. Col. J. Sidney...Wroton Abbey, Banbury	May 8, 1839	Mar. 5, 1890
†NORTHBROOK, Earl of...Stratton, Micheldever Station, Hants.	—	June 2, 1880
*OGLVY, Sir John, Bart...Baldovan House, Dundee, N.B.	Feb. 5, 1840	Mar. 5, 1890
PAGET, Lord Alexander...The Oaklands, Tarporley, Cheshire	July 6, 1881	July 3, 1889
†PEEL, Edmund...Brynnyys, Ruabon	Feb. 3, 1858	Mar. 5, 1890
*PINNEY, Col. William...30 Berkeley Square, W.	Mar. 13, 1839	Mar. 5, 1890
†PORTLAND, Duke of...13 Grosvenor Place, S.W.	—	June 2, 1889

* Elected a Foundation Life Governor March 5, 1890.

† Life Governor.

List of Governors.

	Date of election as Member	Date of election as Governor
†PORTMAN, Viscount...Durweston, Blandford	Aug. 6, 1862	May 5, 1890
†POWIS, Earl of...Powis Castle, Welshpool	—	July 4, 1855
RAVENSWORTE, Earl of...Ravensworth Castle, Gateshead-on-Tyne	Feb. 5, 1868	July 1, 1885
*†RICHMOND & GORDON, Duke of, K.G...Goodwood, Chichester	June 20, 1838	Dec. 2, 1868
†RIDLEY, Sir Matthew W., Bart., M.P....Blagdon, Cramlington	Apr. 7, 1869	May 5, 1886
RIPON, Marquis of, K.G...Studley Royal, Ripon	—	July 3, 1861
*RODD, F....Trebartha Hall, Launceston	July 16, 1839	Mar. 5, 1890
*RUSSELL, Lord C. J. F....Drakelow Lodge, Woburn	May 26, 1838	Mar. 5, 1890
†SALISBURY, Marquis of, K.G...Hatfield House, Herts	—	Feb. 6, 1889
†SALT, Sir W. H., Bart....Maplewell, Loughborough	Feb. 5, 1868	Mar. 5, 1890
SAVILLE, Lord, G.C.B...Rufford Abbey, Ollerton, Notts.	—	Mar. 27, 1889
*SAUNDERS, T. B....The Priory, Bradford-on-Avon	June 13, 1838	Mar. 5, 1890
†SCHRÖDER, Baron J. H. W....The Dell, Staines	Nov. 3, 1869	April 2, 1890
†SEPTON, Earl of...Croxeth, Liverpool	—	Dec. 8, 1869
*SIMONDS, Prof. James Beart...St. John's Villa, Ryde, I. W.	July 25, 1838	Mar. 5, 1890
*SIMONDS, W. Barrow...Abbotts Barton, Winchester	June 19, 1839	Mar. 5, 1890
*SMITH, Henry...The Chestnuts, Leamington	June 19, 1839	Mar. 5, 1890
†SMYTH, Rt. Hon. W. H., M.P....8 Grosvenor Place, S.W.	—	Apr. 5, 1882
†SMYTH, Sir J. H. Greville, Bart...Ashton Court, Bristol	—	July 3, 1878
*SPARKS, William...Crewkerne	June 6, 1838	Mar. 5, 1890
SPENCER, Earl, K.G...Athorp Park, Northampton	Dec. 5, 1860	Mar. 3, 1875
*STRATTON, J. Locke...Turweston House, Brackley	May 13, 1839	Mar. 5, 1890
SUDELEY, Lord...Toddington, Winchcomb	—	Nov. 5, 1879
SUFFIELD, Lord...Gunton Park, Norwich	July 1, 1868	Nov. 3, 1875
†SUTHERLAND, Duke of, K.G...Stafford House, St. James', S.W.	—	July 1, 1868
†SUTTON, John Manners...Kelham, Newark	—	May 8, 1844
†SUTTON, Martin J...Kidmore Grange, Caversham, Oxon.	May 1, 1878	Feb. 1, 1882
SUTTON, Sir R. F., Bart...Benham Park, Newbury, Berks.	—	Dec. 12, 1888
†TANQUERAY, John S...c/o W. Sweetland, 64 Jermyn St., S.W.	Feb. 16, 1848	May 8, 1849
†THEOBOLD, Sir John H., Bart...Syston Park, Grantham	Aug. 5, 1868	May 1, 1889
TREDEGAR, Lord...Tredegar Park, Newport, Mon.	—	May 3, 1876
†TURBERVILLE, Lt. Col. Picton...Ewenny Priory, Bridgend	Feb. 7, 1872	Mar. 3, 1880
†TWEEDMOUTH, Lord...Brook House, Park Lane, W.	July 9, 1845	April 2, 1890
*VERNEY, Rt. Hon. Sir Harry, Bart...Clayden House, Winslow	May 10, 1838	Mar. 5, 1890
†WANTAGE, Lord, V.C...Lockinge, Wantage	June 3, 1863	May 1, 1872
†WARWICK, Earl of...Warwick Castle, Warwick	—	June 1, 1859
WESTMINSTER, Duke of, K.G...Eaton Hall, Chester	July 3, 1860	June 5, 1872
†WHITEHEAD, Charles...Barming House, Maidstone	Apr. 1, 1857	Feb. 6, 1889
WILLOUGHBY DE EBBESBY, Lord...Normanton Park, Stamford	Mar. 3, 1869	May 5, 1875
WINDSOR, Lord...Hewel Grange, Bromsgrove	—	Nov. 6, 1878
*WINMARLEIGH, Lord...Winmarleigh, Garstang	—	May 12, 1838
*WOOD, James...Oakley Manor, Keymer, Sussex	Aug. 8, 1838	Mar. 5, 1890
†YARBURGH, Robert A., M.P...Billinge, Scarr, Blackburn	—	Nov. 7, 1888

* Elected a Foundation Life Governor March 8, 1890.

† Life Governor.

N.B. A List of the 10,700 Members of the Society on the Register at December 31, 1889, has been printed, and a copy will be sent to any Member on application.

TABLE SHOWING THE NUMBER OF GOVERNORS AND MEMBERS
IN EACH YEAR FROM THE ESTABLISHMENT OF THE SOCIETY.

Year	President of the Year	Governors		Members			Total
		Life	Annual	Life	Annual	Honorary	
1838	3rd Earl Spencer	65	121	81	249	—	466
1839	5th Duke of Richmond	—	—	—	—	—	1,100
1840		86	189	146	2,484	5	2,860
1841	Mr. Philip Pusey	91	219	281	4,047	7	4,595
1842	Mr. Henry Handley	101	211	328	5,194	15	5,849
1843	Earl of Hardwicke	94	209	429	6,155	15	6,902 ¹
1844	3rd Earl Spencer	95	214	442	6,161	15	6,927
1845	Duke of Richmond	94	198	527	5,899	15	6,738
1846	Lord Portman	92	201	554	6,105	19	6,971
1847	Earl of Egmont	91	195	607	5,478	20	6,801
1848	Earl of Yarborough	93	186	648	5,387	21	6,335
1849	Earl of Chichester	89	178	582	4,643	20	5,512
1850	Marquis of Downshire	90	169	627	4,856	19	5,261
1851	5th Duke of Richmond	91	162	674	4,175	19	5,121
1852	Earl of Ducie	93	156	711	4,002	19	4,981
1853	Lord Ashburton	90	147	789	3,928	19	4,928
1854	Mr. Philip Pusey	88	146	771	4,152	20	5,177
1855	Mr. William Miles, M.P.	89	141	795	3,888	19	4,882
1856	Lord Portman	85	139	839	3,896	20	4,979
1857	Mr. E. Denison, M.P.	83	137	896	3,988	19	5,068
1858	Earl Berners	81	133	904	4,010	18	5,146
1859	Duke of Marlborough	78	130	927	4,008	18	5,161
1860	Lord Walsingham	72	119	927	4,047	18	5,188
1861	Earl of Powis	84	90	1,118	3,328	18	4,638
1862	{ H.R.H. Prince Consort	83	97	1,151	3,475	17	4,823
	{ Lord Portman						
1863	Viscount Eversley	80	88	1,268	3,785	17	5,183
1864	Lord Feversham	78	45	1,343	4,013	17	5,496
1865	Sir E. C. Kerrison, Bt., M.P.	79	81	1,386	4,190	16	5,752
1866	Lord Tredgar	79	84	1,395	4,049	15	5,622
1867	Mr. H. S. Thompson	77	82	1,388	3,908	15	5,465
1868	6th Duke of Richmond	75	74	1,409	3,888	15	5,461
1869	H.R.H. Prince of Wales	75	73	1,417	3,864	17	5,446
1870	Duke of Devonshire	74	74	1,511	3,764	15	5,438
1871	Lord Vernon	72	74	1,589	3,896	17	5,643
1872	Sir W. W. Wynn, Bt., M.P.	71	73	1,655	3,953	14	5,766
1873	Earl Cathcart	74	62	1,832	3,936	12	5,916
1874	Mr. Edward Holland	76	58	1,944	3,756	12	5,846
1875	Viscount Bridport	79	79	2,058	3,918	11	6,145
1876	Lord Chesham	83	78	2,164	4,013	11	6,349
1877	Lord Skelmersdale	81	76	2,239	4,073	17	6,486
1878	Col. Kingscote, C.B., M.P.	81	72	2,328	4,180	26	6,637
1879	H.R.H. Prince of Wales	81	72	2,453	4,700	26	7,332
1880	Duke of Bedford	83	70	2,673	5,083	20	7,929
1881	Mr. William Wells	85	69	2,765	5,041	19	7,979
1882	Mr. John Dent Dent	82	71	2,849	5,059	19	8,030
1883	Duke of Richmond & Gordon	78	71	2,979	4,952	19	8,099
1884	Sir Brandreth Gibbs	72	72	3,203	5,408	21	8,776
1885	Sir M. Lopes, Bt., M.P.	71	69	3,356	5,619	20	9,135
1886	H.R.H. Prince of Wales	70	61	3,414	5,569	20	9,184
1887	Lord Egerton of Tatton	71	64	3,440	5,387	20	8,932
1888	Sir M. W. Ridley, Bt., M.P.	66	56	3,521	5,225	16	8,854
1889	H.M. THE QUEEN	73	58	3,567	7,153	15	10,866
1890 (Mar.)	{ Lord Moreton	123	54	3,798	6,987	17	10,929
	{						

¹ The figures for 1843 are taken from the December report, after the removal of the names of members who had discontinued their subscriptions, but it was reported in the previous May that 1,436 had been elected during the preceding twelve months, bringing the then nominal total to 7,385. In all other cases, from 1840 to 1888, the figures are from the May reports. It should, however, be observed that these were occasionally affected by the necessary revision of the list.

ROYAL AGRICULTURAL

Dr.

BALANCE SHEET

[illegible]

SOCIETY OF ENGLAND.

DECEMBER 31, 1889.

xiii

Cr.

Corresponding figures for 1888		£	s.	d.	£	s.	d.
29,033	By 30,000 <i>l.</i> New Consols (2½ per cent.) at cost .				29,033	9	4
	Value on 31st December, 1889, at 96½ = 29,082 <i>l.</i> 10 <i>s.</i> 0 <i>d.</i>						
	[Of this 30,000 <i>l.</i> Stock, 106 <i>l.</i> is held against Special Prizes.]						
	By Books and Furniture at De-						
	cember 31, 1888	£3,184	0	0			
	Furniture purchased in 1889 .	137	12	2			
		3,321	12	2			
3,184	Less: Depreciation at 10 per cent.	332	3	2	2,989	9	0
	By Country Meeting Plant at De-						
	cember 31, 1888	1,834	6	0			
	Plant purchased during 1889 .	69	1	10			
		1,903	7	10			
1,834	Less: Depreciation at 15 per cent.	285	9	6	1,617	18	4
	By Machinery at Dec. 31, 1888 .	1,490	4	0			
1,490	Less: Depreciation at 10 per cent.	149	0	0	1,341	4	0
					5,948	11	4
	By Cash in hand, December 31, 1889:						
2,090	Bankers	2,758	14	7			
	Secretary	51	6	2	2,810	0	9
	By Disbursements on account of 1890 carried						
56	forward to next year				952	17	11
					38,744	19	4
229	Less: Sundry Creditors	278	11	6			
1,288	Subscriptions and Compositions paid in 1889,						
	but belonging to 1890, and carried forward.	410	0	0	688	11	6
36,775					£38,056	7	10

Memorandum:—The above Assets are exclusive of the amount recoverable in respect of arrears of Subscriptions to the 31st December, 1889, which amount to 898*l.*

Examined, audited, and found correct, this 17th day of February, 1890,

FRANCIS SHERBORN

A. H. JOHNSON

C. G. ROBERTS

Auditors on behalf of the Society.

(A) STATEMENT OF ORDINARY INCOME AND

Corresponding
figures
for 1888

Income.

£		£ s. d.	£ s. d.
	ANNUAL SUBSCRIPTIONS:—		
	<i>Governors</i> : Received in 1888 but belonging to 1889	10 0 0	
	Subscriptions for 1889 received in 1889 . . .	285 0 0	
	Subscriptions for previous years	10 0 0	
275			805 0 0
	<i>Members</i> : Received in 1888 but belonging to 1889	868 0 0	
	Subscriptions for 1889 received in 1889 . . .	6,241 13 0	
	Subscriptions for previous years	708 0 0	
4,851			7,812 13 0
	LIFE COMPOSITIONS:—		
	<i>Governors</i> : Received in 1888 but belonging to 1889	50 0 0	
	Received during 1889	255 0 0	
90			805 0 0
	<i>Members</i> : Received in 1888 but belonging to 1889	860 0 0	
	Received during 1889	4,525 0 0	
1,108			5,385 0 0
	INVESTMENTS AND RENTS:—		
	Dividends on Stock	810 17 1	
10	Rents from Sub-letting (1½ years)	820 0 0	
52	Interest on Bank Balances	59 0 1	
1,017			1,189 17 2
	RECEIPTS FROM PUBLICATIONS:—		
120	Ordinary Sales of Journals for 1889 (less Publisher's Charges)	111 12 6	
413	Advertisements in Ditto	287 6 2	
(1½ years)			
192	Sales in Office of Back Numbers of Journal . . .	88 16 9	
30	Sales of Pamphlets	26 9 11	
753			514 5 4
763	Laboratory Fees		755 11 6
2,589			15,767 7 0

ERNEST CLARKE, *Secretary.*
WELTON JONES & CO., *Accountants.*

Corresponding
figures
for 1888

Expenditure

	£	s.	d.	£	s.	d.
GENERAL ADMINISTRATION:—						
1,893	Salaries of Secretarial Staff (including Temporary Assistance)	2,000	11	6		
...	Pensions to Officials	115	16	8		
117	Professional Charges (Solicitors, Auditors, &c.)	73	15	6		
886	House Rent, Taxes, House Expenses and Repairs	928	1	1		
77	Binding, Purchase of Books, and Indexing	72	16	2		
465	Printing and Stationery	868	9	10		
338	{ Postage and Telegrams	198	0	8		
	{ Carriage of Parcels, Cabs, &c.	28	14	4		
	{ Advertising, and Miscellaneous Office Expenses	119	1	8		
3,776					8,895	7 0
JOURNAL OF SOCIETY:—						
913	Printers' Bills for the two Numbers of 1889	1,120	2	6		
...	Cost of Authors' Reprints	81	12	9		
76	Wood Engravings and Illustrations	53	5	0		
416	Literary Contributions	488	18	8		
360	Postage, Packing, and Delivery	477	7	6		
50	Warehousing of Journals	50	0	0		
12	Miscellaneous Journal Printing	16	11	9		
1,890					2,232	18 2
PAMPHLETS:—						
	Printing of Veterinary Pamphlets on "Structure of Horse's Foot," "Dentition," and "Animals of the Farm in Health and Disease" (with cost of Illustrations)	71	2	0		
	Printing of Dairy Pamphlets	8	12	6		
	Printing of Ensilage Pamphlet	29	14	0		
	Payments to Authors of Pamphlets	118	15	0		
	Purchase of Entomological Pamphlets	8	7	9		
					226	11 8
LABORATORY:—						
1,014	Salaries and Wages	1,107	11	1		
44	Apparatus and Chemicals	56	18	11		
77	Printing, Railway Travelling, and Sundry Expenses	108	12	0		
1,135					1,268	2 0
OTHER SCIENTIFIC DEPARTMENTS:—						
175	Consulting Botanist's Salary	200	0	0		
	Expenses of Inquiry into Constituents of Pastures and Cost of Enclosing Plots	51	19	4		
100	Consulting Entomologist's Salary	100	0	0		
200	Grant to Royal Veterinary College	200	0	0		
50 }	Grant to Professor Brown for Scientific Investigations into Diseases of Farm Stock	100	0	0		
9 }	Medals for Proficiency in Cattle Pathology	2	9	0		
2					654	8 4
536						
EDUCATION PRIZES:—						
250	Prizes (55 <i>l.</i>) and Scholarships (140 <i>l.</i>)	195	0	0		
56	Fees to Examiners	76	18	0		
17	Advertising Examinations	12	5	11		
3	Printing	26	9	8		
326					810	8 7
SPECIAL EXPENSES:—						
	Contribution from General Revenue to Windsor Show Account	5,000	0	0		
	Expenses connected with Celebration of Society's Jubilee	116	1	9		
	Contribution to Funds of Mansion House United Association on Railway Rates	50	0	0		
					5,166	1 9
8,637	Total Expenditure				13,758	17 1
	Balance carried to Balance Sheet				2,018	9 11
					15,767	7 0

Examined audited, and found correct, this 17th day of February, 1890.

FRANCIS SHERBORN
A. H. JOHNSON
C. G. ROBERTS

Auditors on behalf of the Society.

METROPOLITAN EXHIBITION

STATEMENT OF RECEIPTS

CONTRIBUTIONS TOWARDS EXPENSES:—		£	s.	d.	£	s.	d.
Net Receipts from Mansion House Fund		5,444	1	8			
Subscription from Windsor Local Committee		2,000	0	0			
Contribution from Windsor Local Committee towards Sleeper Roads		350	0	0			
Contribution from Windsor Local Committee towards Laying Water Mains to additional Ground		59	0	0			
Contribution towards Show Fund from Society's General Revenue		5,000	0	0			
					12,853	1	8
CATALOGUES:—							
Extra Lines in Implement Catalogue		129	14	0			
Woodcuts of New Implements		7	7	6			
					137	1	6
Advertisements in Catalogues					867	15	8
FEES FOR ENTRIES OF IMPLEMENTS:—							
Implement Exhibitors' Payments for Shedding					5,705	0	0
Non-Members' Fees for Entry of Implements					319	0	0
FEES FOR ENTRIES OF LIVE STOCK:—							
By Members:—3,250 Entries @ 5s.		812	10	0			
143 Post Entries @ 10s.		71	10	0			
By Non-members:—586 Entries @ 11s.		596	0	0			
24 Entries of Goats @ 10s.		12	0	0			
40 Post Entries @ 2s.		80	0	0			
					1,512	0	0
Fees for Shedding Accommodation for Vehicles in Harness Classes					12	10	0
Fees for Accommodation of Herdsmen					237	0	0
Fees for Horse Boxes and Stalls					682	5	0
FEES FOR ENTRIES OF POULTRY:—							
By Members:—285 Entries		36	12	6			
By Non-members:—504 Entries		130	10	0			
Entries of Table Poultry, 76 @ 1s.		8	16	0			
					170	18	6
OTHER ENTRY FEES:—							
Non-Members' Fees for Entries of Produce					106	1	0
Fees for Entry in Horse-shoeing Competitions					9	10	0
Deposits of Batter-making Competitors forfeited					3	0	0
MISCELLANEOUS RECEIPTS:—							
Fines for non-exhibition of Live Stock		232	5	0			
Fines for Disobedience to orders of Stewards		14	5	0			
Fines due from previous Shows		45	10	0			
					292	0	0
Prizes for Supply of Refreshments					673	0	0
Prizes for Cloak Rooms and Lavatories					50	0	0

Carried forward £23,112 3 11

AND EXPENDITURE.

COST OF ERECTION OF SHOW-YARD:—

	£	s.	d.	£	s.	d.
Timber, 10,675 <i>l.</i> 17 <i>s.</i> 1 <i>d.</i> ; Joinery, 186 <i>l.</i> 6 <i>s.</i> 10 <i>d.</i>	10,862	3	11			
Ironmongery, 427 <i>l.</i> 13 <i>s.</i> 2 <i>d.</i> ; Hurdles, 420 <i>l.</i> 2 <i>s.</i> 11 <i>d.</i>	847	16	1			
Labour, Paints, Oils, Lead, Glass, &c.	380	6	1			
Bricks, Lime, Cement, Coal, &c.	117	4	6			
Canvas, 2,144 <i>l.</i> 2 <i>s.</i> 8 <i>d.</i> ; Roofing-cloth, Felt, Baize, &c. 344 <i>l.</i> 12 <i>s.</i> 0 <i>d.</i>	2,488	14	8			
Railway Charges, 519 <i>l.</i> 19 <i>s.</i> 5 <i>d.</i> ; Horse Hire, 350 <i>l.</i> 19 <i>s.</i> 5 <i>d.</i>	370	18	10			
Working Dairy:—Bricks and Cement, 133 <i>l.</i> 3 <i>s.</i> 1 <i>d.</i> ; Ironmongery, 4 <i>l.</i> 8 <i>s.</i> 0 <i>d.</i> ; Railway Charges, 1 <i>l.</i> 6 <i>s.</i> 5 <i>d.</i> ; Coal, 1 <i>l.</i> 5 <i>s.</i> 0 <i>d.</i> ; Wages, 41 <i>l.</i> 3 <i>s.</i> 8 <i>d.</i> ; Petty Expenses, 19 <i>s.</i>	182	4	9			
Cardboard Numbers	112	8	6			
Stationery, Postage, and Telegrams	69	4	0			
Insurance, 311 <i>l.</i> 2 <i>s.</i> 0 <i>d.</i> ; Sundries, 371 <i>l.</i> 17 <i>s.</i> 8 <i>d.</i>	68	19	8			
Repairing Engine, 30 <i>l.</i> 18 <i>s.</i> 5 <i>d.</i> ; Repairing Harness, 1 <i>l.</i> 2 <i>s.</i> 6 <i>d.</i>	33	0	11			
Bedticks for Herdsmen, 50 <i>l.</i> 19 <i>s.</i> 0 <i>d.</i> ; Curtains, 26 <i>l.</i> 5 <i>s.</i> 4 <i>d.</i>	77	4	4			
Rent for Storing Plant, 7 <i>l.</i> ; Hire of Plant, Ladders, Poles, &c. 16 <i>l.</i> 4 <i>s.</i> 9 <i>d.</i>	23	4	9			
Fence to Queen's Pavilion	8	0	0			
Horse-shoeing, 3 <i>l.</i> 5 <i>s.</i> 3 <i>d.</i> ; Baskets, 1 <i>l.</i> 6 <i>s.</i> 6 <i>d.</i>	4	11	9			
Compensation	63	7	6			
Wages, 3,563 <i>l.</i> 5 <i>s.</i> 7 <i>d.</i> ; Gratuities, 35 <i>l.</i>	3,588	5	7			
Superintendent of Works, Salary and Expenses	642	4	0			
	20,487	19	10			
Less:—						
Sale of Materials	25,613	10	1			
Work for Exhibitors and Purveyors	2,811	10	1			
	8,425	0	2			
				12,012	19	8

SPECIAL SHOW-YARD WORKS:—

Leveling and Draining:—Wages	276	5	2			
Horse Hire, 128 <i>l.</i> 7 <i>s.</i> 7 <i>d.</i> ; Drain Pipes, 79 <i>l.</i> 19 <i>s.</i> 8 <i>d.</i> ; Ironmongery, 2 <i>l.</i> 2 <i>s.</i> 6 <i>d.</i>	210	9	9			
				486	14	11
Sleeper Roads:—Cost of Sleepers, 450 <i>l.</i> ; Gravel, 55 <i>l.</i> 8 <i>s.</i> 8 <i>d.</i>	505	8	8			
Wages, 134 <i>l.</i> 1 <i>s.</i> 11 <i>d.</i> ; Railway Charges, 538 <i>l.</i> 4 <i>s.</i> 7 <i>d.</i> ; Horse Hire, 38 <i>l.</i> 11 <i>s.</i> 6 <i>d.</i> ; Ironmongery, 4 <i>s.</i> 6 <i>d.</i>	711	2	6			
(Towards this Expenditure the Windsor Local Committee contributed 350 <i>l.</i>)	1,215	11	2			
Less:—						
Sale of Sleepers	258	1	0			
				958	10	2
Restoration of Ground:—Wages, 122 <i>l.</i> 2 <i>s.</i> 2 <i>d.</i> ; Horse Hire, &c. 60 <i>l.</i> 11 <i>s.</i> 10 <i>d.</i>	182	14	0			
Repairing Fences, 6 <i>l.</i> 8 <i>s.</i> 0 <i>d.</i> ; Grass Seeds, 4 <i>l.</i> 1 <i>s.</i> 6 <i>d.</i>	11	3	6			
				193	17	6
Laying Gas and Water Mains:—Gas Mains, 11 <i>l.</i> ; Water Mains, 36 <i>l.</i> 19 <i>s.</i> 7 <i>d.</i>				106	19	7
(Towards the laying of the Water Mains to additional Ground, the Windsor Local Committee contributed 38 <i>l.</i>)						
Clearing up Manure:—Wages, 24 <i>l.</i> 0 <i>s.</i> 5 <i>d.</i> ; Horse Hire, 31 <i>l.</i> 12 <i>s.</i> 0 <i>d.</i>				55	12	5

EXPENSES OF SECRETARY'S DEPARTMENT:—

Secretary's Journeys to Windsor, and Expenses	8	14	9			
Gratuities to Staff for Extra Work	183	15	0			
Evening Allowances to Staff	63	12	9			
Extra Temporary Clerks in Office	282	4	6			
Preparation of Catalogues: Special Staff	101	18	0			
				640	5	0

PRINTING:—

Printing of Prize Sheets, Certificates, Admission Orders, Parchment Numbers, Circulars to Exhibitors, Prize Cards, Members' Tickets, Judges' Books, and Miscellaneous	683	12	4			
Secretary's Local Printing, 11 <i>l.</i> 13 <i>s.</i> 7 <i>d.</i> ; Surveyor's Local Printing, 7 <i>l.</i> 3 <i>s.</i> 0 <i>d.</i>	18	16	7			
General Printing for Stallion Show	11	16	3			
Programmes, 63 <i>l.</i> 14 <i>s.</i> 9 <i>d.</i> ; Plans of Show-yard, 17 <i>l.</i> 3 <i>s.</i> 0 <i>d.</i>	70	17	9			
Implement Catalogue, 428 <i>l.</i> 3 <i>s.</i> 6 <i>d.</i> ; Bound Copies of ditto, 30 <i>l.</i> 13 <i>s.</i> 0 <i>d.</i>	458	18	5			
Stock Catalogue, 1,141 <i>l.</i> 7 <i>s.</i> 9 <i>d.</i> ; Bound Copies of ditto, 58 <i>l.</i>	1,199	7	9			
Carriage of Copies to Show-yard: Implement, 12 <i>l.</i> 10 <i>s.</i> 0 <i>d.</i> ; Stock, 45 <i>l.</i>	57	10	0			
Printing Awards, 251 <i>l.</i> 0 <i>s.</i> 9 <i>d.</i> ; Carriage, 2 <i>l.</i> 16 <i>s.</i> 6 <i>d.</i> ; Services of Bicyclists between London and Windsor, 12 <i>l.</i> 5 <i>s.</i> 0 <i>d.</i>	266	1	8			
				2,746	17	10

ADVERTISING, BILL POSTING, AND PLACARDING:—

Advertising Prices offered, 79 <i>l.</i> 17 <i>s.</i> 11 <i>d.</i> ; Ditto Stallion Show, 10 <i>l.</i> 8 <i>s.</i> 2 <i>d.</i> ; Ad- vertising Show by Posters and Placards, and in Newspapers, 2,345 <i>l.</i> 5 <i>s.</i> 3 <i>d.</i>	2,435	8	5			
Printing of Posters and Placards	240	3	6			
				2,675	9	11
				247	15	10

POSTAGE, CARRIAGE, AND STATIONERY

Carried forward, . . .

290,125 9 10

METROPOLITAN EXHIBITION

STATEMENT OF RECEIPTS

	£	s.	d.	£	s.	d.
Brought forward from page xvi				23,112	2	11
ADMISSIONS TO SHOW-YARD :—						
Saturday, June 23, @ 2s. 6d.	54	2	0			
Monday, June 24, @ 5s.	1,348	4	9			
Tuesday, June 25, @ 2s. 6d.	2,359	3	4			
Wednesday, June 26, @ 2s. 8d.	2,836	14	2			
Thursday, June 27, @ 2s. 6d.	3,029	12	2			
Friday, June 28, @ 1s.	1,587	6	9			
Saturday, June 29, @ 1s.	1,029	0	6			
Season Tickets, @ 10s. 8d.	320	15	6			
Day Tickets, sold at the rate of 2s for 1l.	589	19	6			
Society's Share of Combination Railway Tickets :—						
Great Western Railway	429	8	3			
London and South Western Railway	251	11	6			
				14,892	18	5
ENTRANCES TO HORSE-RING :—						
Monday, June 24	111	7	6			
Tuesday, June 25	238	7	6			
Wednesday, June 26	277	16	0			
Thursday, June 27	813	2	6			
Friday, June 28	123	9	0			
Saturday, June 29	53	15	0			
				1,117	17	6
DAIRY :—						
Receipts at Stand at Working Dairy	59	8	0			
Sales of Produce at Working Dairy	99	8	9			
				158	16	9
SALE OF CATALOGUES				1,088	12	2

PRIZES AWARDED.

The total amount of PRIZES as given opposite was distributed as follows :—

Horses, 2,612l. ; Asses, 30l. ; Cattle, 3,452l. 5s. 0d.	6,094	5	0
Sheep, 2,390l. 5s. 0d. ; Goats, 52l. ; Pigs, 695l.	3,143	5	0
Poultry, 329l. 10s. 0d. ; Corn, 130l. ; Wool, 137l.	590	10	0
Cheese, 252l. ; Butter, 39l. ; Cider and Perry, 174l.	465	0	0
Hops, 160l. ; Jams and Preserved Fruits, 68l.	228	0	0
Buttermaking, 32l. ; Horse-shoeing, 42l.	74	0	0
Implementa, 40l. ; Dairy Appliances, 20l. ; Dairy Designs, 21l.	81	0	0
Contribution to Bee Department	50	0	0
Gold and Silver Medals	314	0	0
	11,047	0	0
Less :—			
Champion and other Prizes offered by various Societies	793	10	0
	10,253	10	0
Premiums to Thoroughbred Stallions	600	0	0
(Towards these Premiums the Mansion House Committee contributed 800l. out of the 5,444l. 1s. 8d. raised by them.)	10,853	10	0

£40,310 7 9

ERNEST CLARKE, Secretary.

WELTON, JONES & Co., Accountants.

AT WINDSOR, 1889.

AND EXPENDITURE (continued).

xix

Brought forward from page xvii.	£	s.	d.
	20,125	2	10
AMOUNT OF PRIZES AWARDED (for details see opposite)	10,883	10	0
COST OF FORAGE FOR LIVE-STOCK:—			
Hay, 798l. 5s. 7d.; Straw, 831l. 19s. 10d.; Green Food, 569l. 5s. 11d.; Fodder for Stewards' Horses, 12l. 9s. 7d.	2,207	0	11
JUDGES' FEES AND EXPENSES:—			
Judges of Implements, 84l.; Ditto, for Lodgings, 27l.	111	0	0
Judges of Horses, 165l. 5s. 0d.; Asses, 12l. 18s. 3d.; Cattle, 275l. 3s. 10d.; Sheep, 298l. 6s. 9d.; Goats, 6l. 1s. 3d.; Pigs, 49l. 14s. 5d.; Poultry, 31l. 3s. 0d.; Cheese, 8l. 10s. 0d.; Butter and Buttermaking, 42l.; Ditto, for Lodgings, 18l.; Wool, 15l. 10s. 0d.; Corn, 7l. 5s. 0d.; Oiler and Parry, 29l. 12s. 4d.; Hops, 26l. 10s. 0d.; Jams and Preserved Fruits, 6l. 12s. 0d.; Horse-shoeing, 84l. 10s. 0d.	1,020	1	10
Badges for Judges and other Officials	25	1	6
Rosettes, 56l. 1s. 8d.; Enamelled Prize Plates, 90l. 6s. 8d.; Ditto, Stallion Show, 8l. 4s. 0d.	150	9	11
	1,306	13	
EXPENSES OF ADMINISTRATION:—			
Stewards:—Houses, 352l. 4s. 6d.; Housekeeping Expenses, 258l. 16s. 2d.; Personal and Railway Expenses, 280l. 12s. 2d.	841	12	10
Assistant Stewards:—Honoraria, 102l.; Railway Expenses, 37l. 8s. 10d.	139	8	10
Secretary and Official Staff:—Secretary's Expenses, 29l. 4s. 1d.; Maintenance of Clerks, 83l. 8s. 4d.; Allowances, 15l. 18s. 6d.; Travelling Expenses, 9l. 6s. 6d.; Official Reporter, 12l. 12s. 0d.; Interpreter, 6l. 1s. 11d.	156	8	4
Finance Office:—Superintendent of Turnstiles, 19l. 6s. 0d.; Money Changer, 12l. 12s. 0d.; Money Takers, 61l. 19s. 0d.; Bankers' Clerks and Commission, 48l. 8s. 6d.; Commission on Sale of Tickets, 13l. 13s. 0d.	155	13	6
Awards Office:—Superintendent, 19l. 10s.; Clerks, 47l. 8s.; Award Boys, 28l. 9s. 9d.	90	7	9
	1,383	11	8
General Management:—			
Superintendent of Yard, 73l. 12s. 4d.; Allowances, 17l.	90	12	4
Foremen and Assistant Foremen	214	19	2
Grooms, 62l. 14s. 6d.; Assistants in Fodder Yard, 46l. 8s. 4d.	109	2	10
Yardmen, 675l. 3s. 2d.; Hats and Jackets for Yard-men, 14l. 15s. 10d.	689	19	0
Door and Gate-keepers	117	19	0
Carriage Hire, 88l. 1s. 6d.; Horse Hire, 278l. 14s. 0d.	355	15	6
Clark in Honorary Director's Office	12	10	7
	1,501	18	5
Veterinary Department:—			
Veterinary Inspectors, 78l.; Ditto, for Lodgings, 18l.; Veterinary Assistants, 18l. 8s. 6d.; Yardmen, 1l. 10s. 0d.	110	18	6
Engineering Department:—			
Consulting Engineer and Assistants, 39l. 2s. 9d.; Carriage, 8l. 14s.; Repairs and Maintenance 46l. 11s. 10d.; Insurance, 7l. 17s. 6d.	187	6	1
Police:—			
Metropolitan Police, 869l. 7s. 8d.; Local Police, 54l. 15s. 0d.	924	2	5
Messengers:—Commissionaires, 52l. 8s. 10d.; Boy Messengers, 15l. 4s. 11d.	67	10	9
	1,359	17	9
Dairy:—			
Milk, 138l. 8s. 6d.; Ice, 28l.; Dairy Staff 105l. 7s. 8d.	271	16	2
Expenses of Analysing Milk of Dairy Cows	16	3	4
	287	19	6
Poultry:—			
Penning, Attendant, and Food, 14l. 7s. 4d.; Dead Poultry, 15l. 18s. 4d.	30	6	8
Horse-Shoeing:—			
Hire of Forges, 11l. 18s. 9d.; Pails, Nails, and Iron for Com- petitions, 22l. 5s. 11d.; Gratuities, 17s. 6d.	35	3	2
Stallion Show:—			
Society's Share of Expenses	29	0	7
Fire Prevention:—			
Hire of Fire Appliances	49	15	0
SPECIAL EXPENSES:—			
Band of Grenadier Guards	240	18	0
Expenses of Royal Pavilion, Refreshments &c.	211	4	8
House for and Entertainment of Society's Guests	172	7	6
Breakfast to Judges and Official Luncheons	40	13	8
Badges for Council and Officers (Permanent)	120	16	0
	786	5	0
GENERAL SHOW-YARD EXPENSES:—			
Hire of Furniture, 84l. 6s. 0d.; Hire of Chairs &c. 50l. 3s. 5d.	134	14	5
Ashes, 4l. 8s.; Tan, 42l. 8s. 6d.; Disinfectants, 2l. 0s. 6d.; Watering, 5l. 12s. 6d.	54	4	8
Telegraph, 36l. 10s.; Telephone, 18l. 7s. 6d.; Newspapers, 1l. 8s. 12d.	46	5	7
Miscellaneous Payments, Secretary, 15l. 2s. 10d.; Surveyor, 78l. 6s. 4d.	94	9	2
	329	13	8
Balance, carried to Balance Sheet	34	9	9
	£40,810	7	9

Examined, audited, and found correct, this 17th day of February, 1890.

FRANCIS SHEERBORN
A. H. JOHNSON
C. G. ROBERTS

Auditors on behalf of the Society.

PRIZE LIST

FOR

PLYMOUTH MEETING, JUNE 21 to 27, 1890.

SUMMARY OF PRIZES.

Classes			Total Value		Classes			Total Value	
			£	s.				£	s.
HORSES.	1 to 48.		1,508	0	JAMS AND PRE-SERVED FRUITS	271 to 275	50	0	
CATTLE.	49 to 101.		1,754	0	HIVES AND HONEY	276 to 290	31	10	
SHEEP.	102 to 148.		1,315	0	IMPLEMENTS AND DAIRY APPLIANCES		200	0	
PIGS.	149 to 172.		452	0	FARM PRIZE COMPETITION		300	0	
POULTRY.	173 to 251.		276	10	BUTTER-MAKING COMPETITIONS		82	0	
WOOL.	252 to 255.		16	0	HORSE-SHOERING COMPETITIONS		42	0	
CHEESE.	256 to 261.		182	0					
BUTTER.	262 to 266.		137	0					
CIDER AND PERRY	267 to 270		40	0					
					TOTAL			6,281	0

Last Day of Entry for Stock and Farm Produce, THURSDAY, MAY 1, 1890.
(Post Entries at Double Fees up to MONDAY, MAY 12.)

Copies of the detailed Regulations and Conditions under which these Prizes (which are open for General Competition) can be competed for, and Forms of Certificates of Entry, can be obtained on Application to the Secretary at 12 Hanover Square, London, W.

HORSES.

		Prizes					Prizes		
HUNTERS.		1st	2nd	3rd	COACH HORSES.		1st	2nd	3rd
Class		£	£	£	Class		£	£	£
1 MARE AND FOAL		20	10	5	6 STALLION, foaled previously to 1889		20	10	5
2 Filly, foaled in 1887		15	10	5	7 MARE AND FOAL		20	10	5
3 Filly, foaled in 1888		15	10	5	8 Filly, foaled in 1887		15	10	5
4 MARE OR GELDING, foaled in the year 1884 or 1885:—1					9 Filly, foaled in 1888		15	10	5
(a) Light weight, up to 12 stones		20	10	5					
(b) Weight-carrier, up to 15 stones		20	10	5					
5 MARE OR GELDING, foaled in 1886		20	10	5					

HACKNEYS.

10 STALLION, foaled before 1888, above 15 hands		20	10	5
11 STALLION, foaled before 1888, above 14 and not exceeding 15 hands		20	10	5
12 STALLION, foaled in 1888		15	10	5
13 BROOD MARE AND FOAL, above 15 hands		15	10	5

1 Offered by the Plymouth Local Committee.
2 Offered by the Hackney Horse Society.

HORSES—continued.

Class	HACKNEYS—cont.	Prizes		
		1st	2nd	3rd
		£	£	£
14	BROOD MARE AND FOAL, above 14 hands and not exceeding 15 hands	15	10	5
15	MARE OR GELDING, foaled in either 1884 or 1885, not less than 14 hands and not exceeding 15 hands ¹	15	10	—
16	MARE OR GELDING, above 15 hands ¹	15	10	—

PONIES.

17	STALLION, not exceeding 14 hands	15	10	5
18	BROOD MARE AND FOAL, not exceeding 14 hands	15	10	5
19	MARE OR GELDING, above 12 hands 2 inches and not exceeding 14 hands ¹	15	8	8
20	MARE OR GELDING, not exceeding 12 hands 2 inches ¹	10	6	8

DARTMOOR PONIES.

(Not exceeding 13 hands 2 inches.)

21	STALLION, foaled before January 1, 1888 ²	8	4	—
22	MARE in foal, or with foal at foot ²	8	4	—
23	MARE OR GELDING (to be ridden) ²	6	4	—

EXMOOR PONIES.

(Not exceeding 13 hands 2 inches.)

24	STALLION, foaled before January 1, 1888 ²	8	4	—
25	MARE, in foal or with foal at foot ²	8	4	—
26	MARE OR GELDING (to be ridden) ²	6	4	—

A Champion Prize of 20l. is offered by the Plymouth Local Committee for the best Pony in Classes 19, 20, 23, and 26, suitable for riding purposes.

Class	SHIRE.	Prizes		
		1st	2nd	3rd
		£	£	£
27	STALLION, foaled in 1887	20	10	5
28	STALLION, foaled in 1888	20	10	5
29	STALLION, foaled in 1889	20	10	5
30	MARE AND FOAL	20	10	5
31	FILLY, foaled in 1887	15	10	5
32	FILLY, foaled in 1888	15	10	5
33	FILLY, foaled in 1889	15	10	5

Champion Prizes of 25l. for the best Shire Stallion and of 15l. for the best Shire Mare or Filly are offered by the Shire Horse Society.

CLYDESDALE.

34	STALLION, foaled in 1887	20	10	5
35	STALLION, foaled in 1888	20	10	5
36	MARE AND FOAL	20	10	5
37	FILLY, foaled in 1887	15	10	5
38	FILLY, foaled in 1888	15	10	5

Two Champion Prizes of 25l. each for the best Clydesdale Stallion and for the best Clydesdale Mare or Filly are offered by the Clydesdale Horse Society.

SUFFOLK.

39	STALLION, foaled in 1887	20	10	5
40	STALLION, foaled in 1888	20	10	5
41	STALLION, foaled in 1889 ³	15	10	—
42	MARE AND FOAL	20	10	5
43	FILLY, foaled in 1887	15	10	5
44	FILLY, foaled in 1888	15	10	5
45	FILLY, foaled in 1889 ³	15	10	—

AGRICULTURAL HORSES.

(Not qualified to compete as Suffolks, Clydesdales or Shires, adapted for a hilly country.)

46	STALLION, foaled previously to 1888	15	10	—
47	MARE OR GELDING, foaled in or after the year 1884 ¹	15	10	—
48	PAIR OF DRAUGHT HORSES (Mare or Gelding), suitable for Agricultural purposes in Devon and Cornwall ¹	15	10	—

CATTLE.

SHORTHORN.				
49	BULL, calved in 1884, 1885, 1886, or 1887	20	10	5
50	BULL, calved in 1888	20	10	5
51	BULL, calved in 1889	20	10	5
52	COW OR HEIFER, in-milk or in-calf, calved previously to or in 1887	20	10	5

53	HEIFER, calved in 1888	15	10	5
54	HEIFER, calved in 1889	15	10	5

Two Champion Prizes of 25l. each for the best Male and the best Female Shorthorn are offered by the Shorthorn Society.

¹ Offered by the Plymouth Local Committee.

² Offered by the Devon County Agricultural Association.

³ Offered by the Suffolk Stud-Book Association.

CATTLE—continued.

Class	HEREFORD.	Prizes		
		1st	2nd	3rd
		£	£	£
55 BULL, calved in 1884, 1885, 1886, or 1887		. 20	10	5
56 BULL, calved in 1888		. 20	10	5
57 BULL, calved in 1889		. 20	10	5
58 COW OR HEIFER, in-milk or in-calf, calved pre- viously to or in 1887		. 20	10	5
59 HEIFER, calved in 1888		. 15	10	5
60 HEIFER, calved in 1889		. 15	10	5

DEVON.

61 BULL, calved in 1884, 1885, 1886, or 1887	. 20	10	5
62 BULL, calved in 1888	. 20	10	5
63 BULL, calved in 1889	. 20	10	5
64 COW OR HEIFER, in-milk or in-calf, calved pre- viously to or in 1887	. 20	10	5
65 HEIFER, calved in 1888	. 15	10	5
66 HEIFER, calved in 1889	. 15	10	5

SOUTH DEVON (HAMS).

67 BULL, calved in 1884, 1885, 1886, or 1887 ¹	. 15	10	5
68 BULL, calved in 1888 ¹	. 15	10	5
69 BULL, calved in 1889 ¹	. 10	5	3
70 COW OR HEIFER, in-milk or in-calf, calved pre- viously to or in 1887 ¹	. 15	10	5
71 HEIFER, calved in 1888 ¹	. 10	5	3
72 HEIFER, calved in 1889 ¹	. 10	5	3

SUSSEX.

73 BULL, calved in 1885, 1886, or 1887	. 20	10	5
74 BULL, calved in 1888 or 1889	. 20	10	5
75 COW OR HEIFER, in-milk or in-calf, calved pre- viously to or in 1887	. 20	10	5
76 HEIFER, calved in 1888 or 1889	. 15	10	5

WELSH.

7 BULL, calved in 1885, 1886, or 1887	. 20	10	5
78 BULL, calved in 1888 or 1889	. 20	10	5
79 COW OR HEIFER, in-milk or in-calf, calved pre- viously to or in 1887	. 20	10	5
80 HEIFER, calved in 1888 or 1889	. 15	10	5

RED POLLED.

81 BULL, calved in 1885, 1886, or 1887	. 20	10	5
82 BULL, calved in 1888 or 1889	. 20	10	5

Class	RED POLLED—cont.	Prizes		
		1st	2nd	3rd
		£	£	£
83 COW OR HEIFER, in-milk or in-calf, calved pre- viously to or in 1887			10	5
84 HEIFER, calved in 1888 or 1889		. 15	10	5

JERSEY.

85 BULL, calved in 1884, 1885, 1886, or 1887	. 20	10	5
86 BULL, calved in 1888	. 20	10	5
87 BULL, calved in 1889	. 20	10	5
88 COW OR HEIFER, in-milk or in-calf, calved pre- viously to or in 1887	. 20	10	5
89 HEIFER, calved in 1888	. 15	10	5
90 HEIFER, calved in 1889	. 15	10	5

GUERNSEY.

91 BULL, calved in 1884, 1885, 1886, or 1887	. 20	10	5
92 BULL, calved in 1888 or 1889	. 20	10	5
93 COW OR HEIFER, in-milk or in-calf, calved pre- viously to or in 1887	. 20	10	5
94 HEIFER, calved in 1888 or 1889	. 15	10	5

KERRY.

95 BULL, calved in 1884, 1885, 1886, 1887, 1888, or 1889 ²	. 15	10	0
96 COW OR HEIFER, in-milk or in-calf, calved pre- viously to or in 1887 ²	. 15	10	0
97 HEIFER, calved in 1888 or 1889 ²	. 10	5	0

DEXTER KERRY.

98 BULL, calved in 1884, 1885, 1886, 1887, 1888 or 1889 ²	. 15	10	0
99 COW OR HEIFER, in-milk or in-calf, calved pre- viously to or in 1887 ²	. 15	10	0
100 HEIFER, calved in 1888 or 1889 ²	. 10	5	0

DAIRY CATTLE.

Cows, in-milk (of any breed or cross), giving the greatest quantity of milk containing not less than 12 per cent. solids and 3 per cent. butter-fat.

101 A. Cow, over 1,200-lbs. live weight	. 15	10	5
101 B. Cow between 900-lbs. and 1,200-lbs. live weight	. 15	10	5
101 C. Cow, under 900-lbs. live weight	. 15	10	5

¹ Offered by the Devon County Agricultural Association.

² Offered by the Plymouth Local Committee.

SHEEP.

Class	LEICESTER.	Prizes		
		1st	2nd	3rd
102	TWO-SHEAR RAM . .	£ 15	10	5
103	SHEARLING RAM . .	15	10	5
104	PEN OF THREE RAM LAMBS, dropped in 1890	10	5	-
105	PEN OF THREE SHEAR- LING EWES, of the same flock . .	15	10	5

COTSWOLD.				
106	TWO-SHEAR RAM . .	15	10	5
107	SHEARLING RAM . .	15	10	5
108	PEN OF THREE RAM LAMBS, dropped in 1890	10	5	-
109	PEN OF THREE SHEAR- LING EWES, of the same flock . .	15	10	5

LINCOLN.				
110	TWO-SHEAR RAM . .	15	10	5
111	SHEARLING RAM . .	15	10	5
112	PEN OF THREE RAM LAMBS, dropped in 1890	10	5	-
113	PEN OF THREE SHEAR- LING EWES, of the same flock . .	15	10	5

OXFORD DOWN.				
114	TWO-SHEAR RAM . .	15	10	5
115	SHEARLING RAM . .	15	10	5
116	PEN OF THREE RAM LAMBS, dropped in 1890	10	5	-
117	PEN OF THREE SHEAR- LING EWES, of the same flock . .	10	5	

SHROPSHIRE.				
118	TWO-SHEAR RAM . .	15	10	5
119	SHEARLING RAM . .	15	10	5
120	PEN OF THREE RAM LAMBS, dropped in 1890	10	5	-
121	PEN OF THREE SHEAR- LING EWES, of the same flock . .	15	10	5

SOUTHDOWN.				
122	TWO-SHEAR RAM . .	15	10	5
123	SHEARLING RAM . .	15	10	5
124	PEN OF THREE RAM LAMBS, dropped in 1890	10	5	-
125	PEN OF THREE SHEAR- LING EWES, of the same flock . .	15	10	5

A Champion Cup of the value of 25*l*. for the best Southdown Ram exhibited in Classes 122 and 125 is offered by Southdown Breeders.

Class	HAMPSHIRE DOWN.	Prizes		
		1st	2nd	3rd
126	TWO-SHEAR RAM . .	15	10	5
127	SHEARLING RAM . .	15	10	5
128	PEN OF THREE RAM LAMBS, dropped in 1890	10	5	-
129	PEN OF THREE SHEAR- LING EWES, of the same flock . .	15	10	5

SUFFOLK.				
130	TWO-SHEAR RAM . .	15	10	5
131	SHEARLING RAM . .	15	10	5
132	PEN OF THREE RAM LAMBS, dropped in 1890	10	5	-
133	PEN OF THREE SHEAR- LING EWES, of the same flock . .	15	10	5

SOMERSET AND DORSET HORNED.				
134	RAM, Two-shear and up- wards . .	15	10	5
135	SHEARLING RAM . .	15	10	5
136	PEN OF THREE SHEAR- LING EWES, of the same flock . .	15	10	5

DEV N LONG-WOOL.				
137	RAM, Two-shear and up- wards . .	15	10	5
138	SHEARLING RAM . .	15	10	5
139	PEN OF THREE SHEAR- LING EWES, of the same flock . .	15	10	5

SOUTH DEVON.				
140	TWO-SHEAR RAM ¹ . .	15	10	5
141	SHEARLING RAM ¹ . .	15	10	5
142	PEN OF THREE SHEAR- LING EWES, of the same flock ¹ . .	15	10	5

DARTMOOR.				
143	RAM, Two-shear and up- wards . .	15	10	5
144	SHEARLING RAM . .	15	10	5
145	PEN OF THREE SHEAR- LING EWES, of the same flock . .	15	10	5

EXMOOR.				
146	RAM, Two-shear and up- wards . .	15	10	5
147	SHEARLING RAM . .	15	10	5
148	PEN OF THREE SHEAR- LING EWES, of the same flock . .	15	10	5

¹ Offered by the Devon County Agricultural Association.

PIGS.

Class	LARGE WHITE BREED.	Prizes		
		1st	2nd	3rd
149	BOAR farrowed in 1889	£ 10	£ 5	£ 3
150	PEN OF THREE BOAR PIGS farrowed in 1890	£ 10	£ 5	£ 3
151	BREEDING SOW farrowed previously to or in 1889	£ 10	£ 5	£ 3
152	PEN OF THREE SOW PIGS farrowed in 1890	£ 10	£ 5	£ 3

MIDDLE WHITE BREED.

153	BOAR farrowed in 1889	£ 10	£ 5	£ 3
154	THREE BOAR PIGS	£ 10	£ 5	£ 3
155	BREEDING SOW farrowed previously to or in 1889	£ 10	£ 5	£ 3
156	THREE SOW PIGS	£ 10	£ 5	£ 3

SMALL WHITE BREED.

157	BOAR farrowed in 1889	£ 10	£ 5	£ 3
158	THREE BOAR PIGS	£ 10	£ 5	£ 3
159	BREEDING SOW farrowed previously to or in 1889	£ 10	£ 5	£ 3
160	THREE SOW PIGS	£ 10	£ 5	£ 3

Class	BERKSHIRE BREED.	Prizes		
		1st	2nd	3rd
161	BOAR farrowed in 1889	£ 10	£ 5	£ 3
162	THREE BOAR PIGS	£ 10	£ 5	£ 3
163	BREEDING SOW farrowed previously to or in 1889	£ 10	£ 5	£ 3
164	THREE SOW PIGS	£ 10	£ 5	£ 3

Two Champion Cups of the value of 10l. each for the best Boar in Class 161 and the best Sow in Class 163 are offered by the British Berkshire Society.

ANY OTHER BLACK BREED.

165	BOAR farrowed in 1889	£ 10	£ 5	£ 3
166	THREE BOAR PIGS	£ 10	£ 5	£ 3
167	BREEDING SOW farrowed previously to or in 1889	£ 10	£ 5	£ 3
168	THREE SOW PIGS	£ 10	£ 5	£ 3

TAMWORTH BREED.

169	BOAR farrowed in 1889	£ 10	£ 5	£ 3
170	THREE BOAR PIGS	£ 10	£ 5	£ 3
171	BREEDING SOW farrowed previously to or in 1889	£ 10	£ 5	£ 3
172	THREE SOW PIGS	£ 10	£ 5	£ 3

POULTRY.

FOWLS.

Prizes are offered for the best Cock, Hen, Cockerel, and Pullet respectively of each of the following Breeds:—

Classes	£	£	£
173—176 Dorking, Coloured	2	1	10
177—180 Dorking, Silver Grey	2	1	10
181—184 Dorking, White or any other variety	2	1	10
185—188 Game, Old English	2	1	10
189—192 Game, Indian	2	1	10
193—196 French	2	1	10
197—200 Brahma	2	1	10
201—204 Cochins	2	1	10
205—208 Langshan	2	1	10
209—212 Wyandotte	2	1	10
213—216 Plymouth Rock	2	1	10
217—220 Minorca	2	1	10
221—224 Andalusian	2	1	10
225—228 Leghorn	2	1	10
229—232 Hamburg	2	1	10

Table Fowls.

233	Pair of Cockerels of 1890, of any pure breed	£ 2	£ 1	£ 10
234	Pair of Pullets, ditto	£ 2	£ 1	£ 10
235	Pair of Cockerels of 1890, cross from Dorking and any other pure breed	£ 2	£ 1	£ 10
236	Pair of Pullets, ditto	£ 2	£ 1	£ 10

Table Fowls—cont.

Classes			
237	Pair of Cockerels of 1890, cross from Game and any other pure breed . . .	£ 2	£ 1 10
238	Pair of Pullets, ditto . . .	£ 2	£ 1 10

DUCKS.

Prizes are offered for the best Drake and Duck, and for Young Drake and Duckling of the following Breeds:—

239—240	Aylesbury	£ 2	£ 1	£ 10
241—242	Rouen	£ 2	£ 1	£ 10
243—244	Pekin	£ 2	£ 1	£ 10
245—246	Any other Useful Breed	£ 2	£ 1	£ 10

Table Ducks.

247	Pair of Ducklings of 1890, of any pure breed	£ 2	£ 1	£ 10
248	Pair of Ducklings of 1890, of a first cross from any pure breeds	£ 2	£ 1	£ 10

Geese.

249	Gander and Goose	£ 2	£ 1	£ 10
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Turkeys.

250	Cock	£ 2	£ 1	£ 10
251	Hen	£ 2	£ 1	£ 10

PRODUCE.

Class WOOL.
252—255 Three Fleeces DEVON LONG WOOL, SOUTH DEVON, DARTMOOR, EXMOOR respectively.
Prize of 4*l*. in each Class.

	Prizes		
	1st	2nd	3rd
CHEESE.	£	£	£
256 THREE CHEDDAR, not less than 50 lbs. each, made in 1889	15	10	5
257 THREE CHESHIRE, of not less than 40 lbs. each, made in 1889	15	10	5
258 SIX STILTON, of 1889 make	15	10	5
259 THREE CHEESES, of any British make, made in 1890	15	10	5

Soft Cheese.

260 THREE CREAM CHEESES.	8	2	1
261 THREE BRITISH SOFT CHEESES, other than cream (made from milk, no extra cream added).	8	2	1

BUTTER.

262 THREE POUNDS FRESH BUTTER, absolutely free from salt	Five of 5 <i>l</i> . each Five of 8 <i>l</i> . each		
263 THREE POUNDS FRESH BUTTER, slightly salted	Five of 5 <i>l</i> . each Five of 8 <i>l</i> . each		
264 THREE POUNDS BUTTER, made from Scalded Cream ¹	Five of 5 <i>l</i> . each Five of 8 <i>l</i> . each		
265 THREE POUNDS WHRY BUTTER, without any admixture of Fresh Milk or Cream	1st	2nd	3rd 4th
	£	£	£ £
266 ONE KEG OR OTHER PACKAGE OF SALT BUTTER, not less than 14 lbs.	5	3	2 1

CIDER AND PERRY.

	1st	2nd	3rd
	£	£	£
267 Cask CIDER made in the autumn of 1889	5	3	2
268 One Dozen CIDER made in the autumn of 1889	5	3	2
269 One Dozen CIDER made in any year before 1889	5	3	2
270 One Dozen PERRY	5	3	2

Class	JAMS AND PRESERVED FRUITS.	Prizes		
		1st	2nd	3rd
		£	£	£
271 Collection of JAMS		5	3	2
272 Collection of FRUIT JELLIES		5	3	2
273 Collection of BOTTLED FRUITS		5	3	2
274 Collection of PRESERVED FRUITS for Dessert purposes		5	3	2
275 Collection of DRIED or EVAPORATED FRUITS for Cooking purposes		5	3	2

HIVES, HONEY, &c.

Offered by the British Bee-keepers' Association.

	1st	2nd	3rd	4th
	£	£	£	£
276 Collection of HIVES and APPLIANCES	40	30	-	-
277 OBSERVATORY HIVE stocked with Bees and Queen	20	15	10	-
278 FRAME HIVE for general use, unpainted	20	15	10	-
279 FRAME HIVE for Cottager's use	20	15	10	-
280 HONEY EXTRACTOR	15	10	-	-
281 SECTION RACKS, fitted for use and interchangeable	15	10	5	-
282 FEEDER	10	5	-	-
283 12 Sections COMB HONEY, gross weight about 12 lbs.	20	10	5	-
284 6 Sections COMB HONEY, gross weight about 6 lbs.	20		5	-
285 Section of COMB HONEY	15	10	-	-
286 RUN or EXTRACTED HONEY, gross weight about 24 lbs.	80	20	10	5
287 GRANULATED HONEY, gross weight about 12 lbs.	20	10	5	-
288 Display of HONEY, in any form	60	40	20	-
289 USEFUL INVENTIONS introduced since 1888. Special Prizes according to merit.				
290 Most interesting and instructive EXHIBIT not mentioned in the foregoing Classes	20	10	5	-

¹ Offered by the Plymouth Local Committee.

IMPLEMENTS.¹

Class	Prizes			Class	Prizes		
	1st	2nd			1st	2nd	
	£	£	£		£	£	£
1 LIGHT PORTABLE MOTORS, steam or other, up to five brake-horse-power.				2 GRIST MILLS for use on a farm, to be worked by an engine not exceeding ten brake-horse-power .	20	10	
(a) Motors using Solid Fuel (including Steam Engines and Hot Air Engines)	30	20		3 DISINTEGRATORS, suitable for working with a portable or traction engine not exceeding twenty brake-horse-power .	20	10	
(b) Motors using Liquid or Gaseous F	30	20		4 PLANT FOR CIDER-MAKING, suitable for use on a farm .	20	10	

DAIRY APPLIANCES.¹

5 Strong DAIRY THERMOMETER	1	-		8 VESSEL TO CONTAIN PRESERVED BUTTER, closed hermetically, without the use of solder	2	-	
6 Collection of non-returnable PARCEL-POST BOXES to carry from 1 lb. to 5 lbs. of butter .	2	1		9 SIEVE OR SILE for use in Dairy	1	-	
7 Collection of non-returnable PARCEL-POST BOXES to carry from 5 lbs. to 10 lbs. of butter	2	1					

FARMS.

1 For the best managed	1st 2nd 3rd			2 ARABLE AND GRASS FARM above 100 and not exceeding 200 acres, of which not less than one-half shall be arable .	1st 2nd 3rd		
	£	£	£		£	£	£
ARABLE and GRASS FARM of 200 acres and upwards, of which not less than one half shall be arable	60	40	-	3 ARABLE and GRASS FARM above 40 and not exceeding 100 acres	60	40	20

BUTTER-MAKING COMPETITIONS.

CLASS 1. (Tuesday, June 24) Dairymaids who have won a prize at any Agricultural or Dairy Show.

CLASS 2. (Wednesday, June 25) Dairymaids who have not before won a prize at any Agricultural or Dairy Show.

PRIZES: 1st 5*l.*, 2nd 4*l.*, 3rd 3*l.*, 4th 2*l.*, 5th 1*l.*, in each class.

HORSE-SHOEING COMPETITIONS.

LIMITED TO SHOEHING SMITHS IN THE COUNTIES OF BERKS, CORNWALL, DEVON, DORSET, HANTS, KENT, SOMERSET, SURREY, SUSSEX, AND WILTS.

CLASS 1. HUNTERS (Tuesday, June 24, and, if required, Wednesday, June 25).

CLASS 2. AGRICULTURAL HORSES (Thursday, June 26, and, if required, Friday, June 27).

PRIZES: 1st 10*l.*, 2nd 5*l.*, 3rd 3*l.*, 4th 2*l.*, 5th 1*l.*, in each class.

The Worshipful Company of Farriers of London will present the Freedom of their Guild free of cost to the winner of the First Prize in each Class, and have also provided the funds for the two First Prizes.

¹ The Entries in these Classes close on April 1st.

² The Entries for the Farm Competition closed on December 7, 1889.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, FEBRUARY 5, 1890.

LORD MORETON (PRESIDENT) IN THE CHAIR.

Present:—

Trustees.—The Duke of Richmond and Gordon, K.G., Earl Cathcart, Mr. J. D. Dent, Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart.

Vice-Presidents.—Right Hon. Sir Massey Lopes, Bart., Mr. Walter Gibbey, Sir John Thorold, Bart., Mr. C. Whitehead.

Other Members of Council.—H.R.H. Prince Christian, K.G., Mr. G. M. Allender, Mr. J. H. Arkwright, Mr. J. Bowen-Jones, Mr. J. A. Caird, Mr. Chandos-Pole-Gell, Mr. Charles Clay, Earl of Coventry, Mr. Percy E. Crutchley, Mr. Alfred Darby, Mr. C. de L. F. De Laune, Viscount Emllyn, Mr. S. P. Foster, Mr. William Frankish, Mr. James Hornsby, Mr. T. H. Miller, Mr. P. A. Muntz, M.P., Hon. Cecil T. Parker, Mr. Albert Pell, Mr. Daniel Pidgeon, Mr. J. E. Ransome, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. Alfred J. Smith, Mr. Henry Smith, Sir Joseph Spearman, Bart., the Marquis of Stafford, Mr. R. Stratton, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. C. W. Wilson, Sir Jacob Wilson.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Mr. E. W. Voelcker, Acting Consulting Chemist; Mr. Wilson Bennison, Surveyor.

The following members of the Plymouth Local Committee were also present: the Mayor of Plymouth and Mr. Edward St. Aubyn.

The minutes of the Council held on December 11 last were read and confirmed.

Death of a Member of Council.

The PRESIDENT said that before the ordinary business of the day was commenced it was his melancholy duty to announce officially the death of one of their most esteemed colleagues, Mr. Herbert J. Little. Mr. Little had been for more than eight years a member of the Council, and during the whole of that time had worked actively and energetically on behalf of the Society. He was a man of exceptional ability, and he (Lord Moreton) was sure that he was only expressing the feeling of every member in that room when he said that the Society had lost in Mr. Little one of its most able and active members.

Election of New Members.

The election of the following fifty-six members was then proceeded with:—

BATTAMS, George B... Kilworthy, Tavistock.
BLAMEY, W. O... Penmare, Veryan, Grampond Road, Cornwall.
BLAND, J. L... Blandsfort, Abbeyleix, Queen's Co., Ireland.
BOOG, T. Elliot... Tehidy Office, Camborne, Cornwall.
BOULTON, H. W... The Leys Farm, Alychchurch, Worcester.
BOULTON, J. B... Alychchurch, Worcester.
BYRD, David E... Spurstow Hall, Tarporley, Cheshire.
CALTHROP, F. Cecil... Briars Cottage, Formby, Liverpool.
CAPEL, Arthur... Bulland Lodge, Wiveliscombe, Somerset.
CARRINGTON, W. H... Fricquet, Castel, Guernsey.
CLARK, Henry... Frampton Mansell, Stroud.
CODDINGTON, Lt.-Col. J. N... Old Bridge, Drogheda, co. Meath, Ireland.
COOK, N... Chevithorne Barton, Tiverton.
COOTE, C. J... Mount Coote, Kilmallock, co. Limerick, Ireland.

CREBER, W. F...Lanjore, St. Germans, Cornwall.
 CROMAR, Robert...Brook Farm, Landridge, Redhill, Surrey.
 DEIGHTON, R. M...Elmsfield, Milnthorpe, Westmoreland.
 DINGLE, J. Darley...Darley, Callington, Cornwall.
 DRABBLE, Peter Brownell...Woodside, Sundridge, Sevenoaks, Kent.
 EASTES, William...Guston Court Farm, Dover.
 FLOWERDEW, H. H...Walton Hill, Preston, Lancashire.
 FORD, Henry...Deptford Ct., Ivybridge, Devon.
 FRANKLIN, Joseph N...The Bussels, Huxham, Exeter.
 GROSSER, Albert...31 George St., Plymouth.
 HOARE, Henry H. A...Wavendon, Woburn.
 HUNT, Rev. Thos. Henry...Rayton Park, Shrewsbury.
 JADHAVA, Khasherao Bhagavantrao...Baroda, Bombay Presidency, India.
 JENNINGS, Richard...9 Bedford Pk., Plymouth.
 LASSEY, Edmund...Victoria Rd., Morley, Leeds.
 LORD, H...Trewall, St. Germans, Cornwall.
 MATTHEWS, Thos...Fontigary Farm, Barry, Cardiff.
 MARTINDALE, John W...Mixon Hay Farm, Leek, Staffordshire.
 MORRIS, Thomas...Penarth Glamorgan.
 NUTTALL, J...19 Longfield, Heywood, Lancs.
 OLIVER, Robert...St. Germans, Cornwall.
 PARSON, N...Higher Tregantle, Millbrook, Plymouth.
 PENNER, W. Rous Treadman...Budoekvean, Falmouth.
 PENNELL, Charles...Lincoln.
 PLUMPTRE, H. F. Goodnestone...Wingham, Kent.
 POUNTNEY, Thomas C...Bittell Farm, Alvechurch, Worcester.
 ROBINSON, C. W...Lineage Farm, Burford, Tenbury.
 SANFORD, H. B...30 Bank Street, Sheffield.
 SIMONDS, R. Henville...Winterbourne Abbas, Dorchester.
 SNELL, Samuel F...Blackadon, Menheniot, Cornwall.
 STEVENSON, E. H...Wroxeter Vicarage, Shrewsbury.
 TIPPING, Lt.-Col. Wm. Fearon...Brasted Park, Sevenoaks, Kent.
 TOMPEX, T...Holt Hall, Whitacre, Birmingham.
 TRANT, B...Tregood St. Martins, Sandplace B.S.O., Cornwall.
 TROOD, Edward...Rosecliffe, Saltash, Cornwall.
 VEBBIN, W. H...Darnhall Hall, Winsford, Chester.
 WADAMS, Thos...Lodge Farm, Alvechurch, Worcester.
 WATSON, Wm...Grove Ho., Beverley, Yorks.
 WILLIAMS, O. F...Weirand, Ross.
 WILLYAMS, H. J...Nanskeval, St. Columb, Cornwall.
 WYATT, J. A. Penfold...Harsfold, Billingshurst, Sussex.
 YOUNG, Townend...Richmond Park, Handsworth, Yorks.

The reports of the several Committees were then presented and adopted as below:—

Finance.

Sir NIGEL KINGSCOTE reported his election as Chairman of the year.

The accounts for the month ended on December 31, as certified by the Society's Accountants, showed receipts amounting to 1,273*l*. 6*s*. 9*d*., and expenditure 1,914*l*. 16*s*. The balance at the bankers' on December 31, 1889, allowing for cheques outstanding, was 2,758*l*. 14*s*. 7*d*. The accounts for the month of January, 1890, showed receipts amounting to 4,879*l*. 12*s*. 1*d*., and expenditure 397*l*. 0*s*. 6*d*. The balance at the bankers' on January 31, allowing for cheques outstanding, was 7,241*l*. 6*s*. 2*d*. Accounts amounting in all to 980*l*. 12*s*. 2*d*. were recommended for payment: It had been customary to issue a new list of members once every three years. As the last list issued was published in 1887, the Committee had ordered a new alphabetical list to be printed, copies of which were laid upon the table. They recommended that the list be now issued at the price of 2*s*. 6*d*. per copy.

Sir NIGEL KINGSCOTE also reported that the Committee had considered the accounts and draft balance-sheet for 1889, which had been approved, and the Committee were unanimous in recommending that out of the receipts for 1889 the sum of 5,000*l*. be placed to the credit of the Windsor Show.

They recommended that the names of twenty-two life and twenty-four annual members who were deceased, seventy-two members who had resigned, four life and eleven annual members whose addresses could not be discovered, and of ten members in arrears with their subscriptions, be struck off the Society's books. The Committee had given orders for the reinstatement of five members who had, since their names were struck off the books, paid the subscriptions owing by them. The total number of members on the books after these alterations (excluding those of new members nominated for election) was 10,882.

Financial Results of the Year 1889.

Sir NIGEL KINGSCOTE then said:—As this is the first meeting of the Council which has been held since the termination of 1889, the present is the proper occasion on which to report to the Council, and through

them to the members at large, the financial results of that eventful year in the Society's history.

The Council will remember that at the commencement of the year we had issued our prize-sheet for the great Windsor Meeting; and, confident of the generous support of the inhabitants of the Metropolis and of the approval of our own members, had pledged ourselves to an expenditure of 12,000*l.* for prizes alone, besides an outlay for works and administrative expenses which, with the experience of past years before us, could not be estimated at less than as much again. We all of us expected a big Meeting; but no one could have forecast the enormous, and one may truly say colossal, dimensions which the Show ultimately assumed.

With the prizes all open for general competition, the Society obviously could not pick and choose the entries, but had to find room for all comers; and, as is well known, the expenses to the Society of the shedding, food, and general supervision of the stock exhibited are very far in excess of the small charge imposed as the entry fee.

As the Council said in their report to the General Meeting of December 12 last: "That the Windsor Meeting was not likely to result in an absolute profit to the Society was recognised by the Council from the first; and the dimensions which the Show assumed when the entries were found to be so unprecedentedly large necessarily involved the Society in expenditure which it was impossible that the entry fees and the payments for the admission of non-members should recoup. The Show being considerably more than twice as large as usual, all the attendant expenses for shedding, fodder, printing, judges' fees, administrative staff, wages, police, and the like, were necessarily increased in proportion, whilst on the other hand, not much beyond the average attendance of paying visitors could be looked for." I shall not myself readily forget the afternoon of Saturday, May 4, a day or two after the entries were closed, when I met in a council of war at the Showyard the Honorary Director, the Secretary, and the Surveyor, to consider the ways and

means of accommodating the enormous number of entries which had been pouring in at Hanover Square at the rate of many hundreds a day. As a result of the decision then arrived at, the country was scoured for timber of the size we wanted, almost every available bit of canvas was pressed into service, and an army of men were employed to erect the extra shedding found to be necessary; whilst at Hanover Square a considerable additional staff had to be organised, and all the officials had to work twelve hours a day till the Show opened, in order to get through the business.

It is not necessary to go into further details as to this. Those who know anything of the organisation and administration of Shows will have been prepared for the announcement that the takings at the doors, the fees for entries, and the other receipts were insufficient to meet the cost of building the shedding, paying the prizes, and defraying the preparatory outgoings, and the exceptionally heavy administrative expenses of the period of the Show itself.

We had estimated that if the Mansion House Fund which the then Lord Mayor, Sir Polydore De Keyser, was kind enough to inaugurate, and which his successor, Sir James Whitehead, did so much to promote, could be brought up to 10,000*l.*, we might be able to meet the expenses. In the public appeal for additional funds, which appeared in the newspapers on our Jubilee day last March, the Lord Mayor, after referring to the reliance of the Society upon the support of the City and Metropolis when it offered so large a prize-list as 12,000*l.*, said that the Mansion House Fund then amounted to about 5,000*l.*, and that at least as much again—i.e., a total of 10,000*l.*—was needed.

For various reasons, upon which it is not now necessary to enter, only a net amount of 5,444*l.* (after allowing for expenses) was collected in the City, and as 300*l.* of this was allocated to premiums for thoroughbred stallions, but 5,144*l.* remained available towards the general expenses of the Show. Since the final result, as ascertained by the auditors, was an excess of expenditure over receipts of

4,965 $\frac{1}{2}$ %, it will be seen that our original forecast was realised in quite a remarkable manner, for if we could have raised in the City 10,000%, this excess would have been almost exactly wiped out.

It is with much gratification, however, that I am in a position to announce that the general result of the working of the Society during 1889 is so satisfactory that we are able out of our own resources to place to the credit of the Windsor Show the 5,000% more which we originally hoped to obtain from extraneous contributions, and, notwithstanding this, to carry forward the handsome balance of 2,013 $\frac{1}{2}$ % to the credit of next year. I am sure that all the Council, and the members of the Society at large, will desire that the most brilliant and successful Agricultural Show that has ever been held, a Show honoured by the immediate presidency of our Sovereign, and the active personal interest of the Royal Family, and which has done more to enhance the credit and reputation of the Society than anything else that could be mentioned, should not have attached to it the undeserved stigma of being a financial failure.

Our extra receipts for that Show have come to us not in swollen admission fees at the gates, but in the much more satisfactory and permanent form of a large, influential, and enduring increase of our number of members. In moving, therefore, that out of our receipts for the year 1889 the sum of 5,000% be placed to the credit of the Windsor Show, which did so much for the Society, and was so effectual a recruiting agent for it, I feel sure that I shall have the cordial and unanimous support of the Council.

Turning now to the items of receipt which have made this proposal possible, I find that during the year we received no less than 7,617% for annual subscriptions, as against 5,126% in 1888, the subscriptions received in advance being carried forward in both cases to the year to which they properly belong. One excellent result of the general interest excited amongst members by the Windsor Show was that we received during the year the unusually large

sum of 703% for subscriptions in arrear. The receipts from life compositions during 1889 were no less than 5,690%, as against 1,198% in 1888, the same adjustment of figures as in the case of subscriptions being made to bring the compositions into the year in which the members' privileges commenced.

Our other sources of income can be dismissed in a few words, as they were much the same as usual. Investments and rents yielded 1,190% as against 1,017%; the sales of the Journal and other publications, and receipts from advertisements yielded 514% as against 755% (in which, however, one and a half year's advertisements were included); and the fees paid by members for chemical analyses yielded 756% as against 763% in 1888. Our total income was therefore 15,767%, as against 9,539 in 1888, or an increase of no less than 6,228%.

It may, perhaps, be urged that a portion of this really represents capital, as the life compositions received ought to be spread over a series of years. We have not been unmindful of this possible criticism; but as the life compositions of past years have been placed to the credit of current revenue, whatever their amount, we have thought it best to leave the old arrangement undisturbed for this year, which is the end of the first half-century of the Society's existence, and of the life composition at the old rate of 10%; and to take time for consideration of the best plan for dealing in the future with life compositions in their relations to revenue.

On the other side of the account, our ordinary expenditure for last year, despite the fact that the great accession of new members necessarily involved increased work and therefore greater expense, was about the same as usual. General administration cost 3,895%, as against 3,776% in 1888; the Journal, of which of course many more copies had to be printed to satisfy the needs of new members, cost 2,233%, as against 1,890%; the Laboratory cost 1,268%, as against 1,135%, and our other Scientific Departments — Botanical, Entomological, and Veterinary, 654%, as against 536%. Our education prizes and examinations, senior and junior,

cost us 310*l.*, as against 326*l.* Three items not in the 1888 account, viz., 227*l.* for pamphlets on various practical subjects, 116*l.* for sundry expenses connected with the celebration of the Society's Jubilee, and 50*l.* given towards the funds of the Mansion House United Association on Railway Rates, bring the total up to 8,754*l.*, against 8,638*l.* in 1888. Adding the 5,000*l.*, which we propose to place to the credit of the Windsor Show account, a net balance remains of 2,013*l.*, which is carried to the balance-sheet.

Summarising very rapidly our financial position now as compared with twelve months ago, we have added to our funds a total of 2,047*l.* from revenue. Deducting 767*l.* for depreciation, at our accustomed liberal rate, of country meeting plant, books and furniture, and machinery, our total assets on December 31, 1889, were 38,056*l.*, as against 36,775*l.* at December 31, 1888 (allowing for subscriptions and compositions paid in advance, but belonging to 1889). We are richer by 1,281*l.* in money, and by 2,000 in members than we were at the end of 1888. Every department of our work has increased and is increasing in importance and usefulness; and we shall, on March 26 next, complete our fiftieth year of corporate existence with a feeling that our position is now more consolidated and secure than at any previous period of the Society's history.

In concluding this somewhat lengthy summary of the results of last year, it is only necessary to add that the detailed accounts of the Windsor Show were finally passed by the auditors on January 6 last, and that the auditors' final examination of the balance-sheet and ordinary receipts and expenditure will take place as soon as the cheques for the accounts belonging to 1889, which have been authorised to-day, have been issued and cashed. The accounts will then, in accordance with our customary usage and precedent, be published *in extenso* in the first number of the Journal of this year. [See pages xii to xix].

After some remarks by Mr. STRATTON and Mr. DENT, the motion of Sir Nigel Kingscote was agreed to.

Tickets for Stallion Show.

On the motion of Sir NIGEL KINGSCOTE it was unanimously resolved:—

That the Secretary be authorised to issue to any candidate for election as a new member, who may make application on or before Saturday, March 1, a ticket of admission to the forthcoming Horse Show at the Royal Agricultural Hall, provided that the usual form of undertaking has been previously signed by the candidate, and that his subscription for the current year has been paid.

Alteration of Bye-laws.

Sir NIGEL KINGSCOTE moved, Sir JOHN THOROLD seconded, and it was unanimously resolved:—

That Bye-law 3 (a) passed at the Council meeting held on May 1 last, be amended by the addition at the end thereof of the words "The Council may at their discretion elect any such Governor or Member, without further payment by him, as a Life Governor of the Society."

Question of Life Composition.

Sir NIGEL KINGSCOTE formally moved, pursuant to notice, and Sir JOHN THOROLD seconded:—

That Bye-law 6, passed at the same meeting, be amended by the addition of the words "may upon his election, or at any subsequent period, compound for all future subscriptions (including that for the current year) by a single payment of 15*l.*"

Mr. STRATTON, in moving the following amendment—

"That the Life Composition be in future 15*l.* between the ages of twenty-one and thirty, and 10*l.* above the age of thirty"—

said he was not going to delay the Council with many more remarks on this subject, because he thought it had been sufficiently discussed. But he must say that 15*l.* was altogether too high, and that a uniform payment for all ages was absolutely inequitable. He thought a 10*l.* payment was sufficient, and had worked well. He was quite prepared to see a payment of 15*l.* up to thirty years of age, and 10*l.* afterwards, which would meet the difficulties raised in regard

to young men remaining members for so long and enjoying the privileges for 10%. He thought that 10% after thirty years of age was a quite sufficient amount for the Life Composition, and that anything more than two sums would be extremely inconvenient.

Mr. BOWEN-JONES, in seconding the amendment, said he thought it would be an equitable arrangement and a fair compromise between the conflicting opinions which existed on the Council.

Mr. RANSOME thought that the 15% composition between the ages of twenty-one and thirty was rather against getting new members between those ages.

Mr. GILBEY said he would content himself by simply moving the resolution which stood in his name:—"That the Life Composition be in future 15% for members over twenty years of age and not more than thirty, 12% 10% for members over thirty and not more than forty, and 10% for members over forty years of age."

Mr. GARRETT TAYLOR seconded this amendment.

Sir NIGEL KINGSCOTE said he thought the Council would allow him to explain the position in which he stood as Chairman of the Finance Committee. He had the cordial support of his colleagues, both of those who were present and of those who were absent—viz., Lord Bridport and Sir Matthew Ridley—with whom he had had considerable correspondence. The Council would remember that on May 1 last, after full debate, they came to a certain decision, and it was not the desire of the Finance Committee that this decision should be disturbed. But Mr. Stratton brought forward at the last meeting of Council a motion which sought to upset the settlement arrived at in May, and although Mr. Stratton's motion was defeated by a large majority, the general feeling of the Council appeared to be that it would be desirable for a member to have the opportunity of paying a life composition upon his election, instead of having to wait for a number of years, as decided by the Council in May. Accordingly, he, as chairman of the Finance Committee, undertook, ministerially only, to make a formal

motion at the present meeting of the Council for the payment of a life composition of 15% for all new members elected after the beginning of this year, which was coming back precisely to the resolution which the Finance Committee asked the Council to accept last May. He did not propose to go over the ground again. He had corresponded with Mr. Stratton on the subject, and had tried to arrange the matter amicably with him, but he found they could not agree. He must still adhere, and ask the Council to agree, to the original proposal of the Finance Committee—viz., that the life composition should be 15% in future.

Mr. FOSTER suggested that Mr. Stratton should substitute thirty-five years for thirty years as the age at which a member could compound at 10%.

Mr. STRATTON accepted this proposition.

The Duke of RICHMOND AND GORDON hoped the Council would adhere to the resolution on the agenda paper. He was old enough to recollect the time when they thought a great deal about a "sliding scale" connected with agriculture. However good that might have been in those days, it had been abandoned for many years. He did not think with regard to the subscription of members of this Society that a sliding scale would be at all a satisfactory mode of arrangement. They had the greatest confidence in this Finance Committee. He supposed that there was no Society whose Finance Committee took more trouble and came to more satisfactory results. The Council had gone thoroughly into the matter, and, as he understood, were satisfied with the proposal which the chairman, Sir Nigel Kingscote, had made. He should ask Sir Nigel to adhere to the motion upon the agenda paper, and to take the sense of the Council upon it.

On the question being put, Mr. Gilbey's amendment was negatived without a division, and Mr. Stratton's (as altered by Mr. Foster) by thirty votes to seven.

Sir NIGEL KINGSCOTE's motion providing for the payment of a life composition of 15% upon election was then carried *non con.*

House.

Sir NIGEL KINGSCOTE reported his election as chairman, and announced that the engraved portraits of Her Majesty the Queen and H.R.H. the Prince of Wales, which had been presented to the Society by Her Majesty and His Royal Highness, had been suitably framed, and were now hanging on the walls of the Council-room. A number of accounts for house expenses had been passed and referred to the Finance Committee.

Journal.

Earl CATHCART reported that he had been elected Chairman for the year. The arrangements to be made for the new series of the Journal had been considered, and the editor had presented a preliminary draft of the contents of the first part of the new series. The Committee reported that the judges of farms had paid their first visit of inspection on January 21 to February 1.

On the motion of Earl CATHCART, it was resolved that the answer from the Council to the suggestion of Messrs. Robertson and Packard, that the Journal should be published monthly in future, should be, "That the Council having, after full discussion, decided at their last meeting that the Journal should be published at quarterly intervals, are unable to reopen the matter."

Chemical.

Viscount EMLYN reported that he had been elected Chairman of the Chemical Committee and of the Woburn Sub-committee for the year. Various matters connected with the Laboratory and Chemical Department had been discussed and settled. The feeding experiments at Woburn were progressing satisfactorily.

Seeds and Plants.

Mr. WHITEHEAD stated that he had been elected Chairman for the year. With regard to the fatal disease attacking cows on a farm belonging to the Duchy of Lancaster Estate, the Committee reported that the Consulting Botanist had ascertained that the cows were principally attacked during the winter, when

they were in the yards, and that therefore it would be useless to examine the pastures at this season, but that he had examined the hay—samples having been sent to him—and had found that it was composed of good grasses, and was free from injurious plants. The Committee recommended that Mr. Carruthers should present a preliminary report upon the pastures offered for investigation in the present season, before the railing-in of the plots, which it was proposed should take place next year.

Veterinary.

Sir JOHN THOROLD reported that he had been elected Chairman for the year. A letter had been received from the Central Chamber of Agriculture, stating that the President of the Board of Agriculture had promised to receive a deputation of Agricultural Associations on Wednesday, the 5th inst., at 4 P.M., for the purpose of urging upon the Government the necessity of early legislation providing for the compulsory slaughter of animals affected with pleuro-pneumonia, and for the payment of compensation for slaughter at the cost of the Imperial exchequer; and the Committee recommended that the Society be officially represented at this deputation by delegates appointed by the Council.

A letter had been received from the Royal Veterinary College assenting to the conditions of the Society's grant of 500*l.* for the establishment at the College of a Chair of Comparative Pathology and Bacteriology, and stating that in founding this most important chair due care would be taken that the Royal Agricultural Society should be identified with its establishment.

Professor Brown had presented the following report:—

PLEURO-PNEUMONIA.—During the eight weeks ending January 25 there were fifty-four fresh outbreaks of this disease reported in Great Britain, viz., thirty-five in England and nineteen in Scotland. The outbreaks in England were in Cumberland, Hants, Kent, Lancaster, London, Middlesex, Norfolk, Notts, Surrey, and East

Sussex; while those in Scotland occurred in the counties of Aberdeen, Edinburgh, Forfar, Lanark, Perth, and Sterling. It may be observed that the counties of Essex, York (W.R.) and Fife, in which the disease was prevalent throughout the greater part of last year, do not appear in the above list, and have therefore been free from the disease for the past two months. In the case of Hants and Notts, counties in which no pleuro-pneumonia existed in 1889, the disease has recently been introduced. In Hants five outbreaks have been reported since the beginning of the year, all due to a lot of cows sent from the neighbourhood of London and sold at Basingstoke in October last.

The number of cattle attacked with this disease, or found diseased after slaughter, during the eight weeks has been 207, while 635 healthy cattle which had been exposed to infection were slaughtered.

In Ireland twelve fresh outbreaks were reported during the eight weeks ended January 25, all of them in the Dublin district; 18 cattle were attacked and 181 healthy ones in contact were slaughtered.

ANTHRAX.—In England twenty-five outbreaks of anthrax were reported between the end of November 1889 and January 25; thirty-four animals were attacked, thirty-two of which died. In Scotland six outbreaks were reported and twelve animals attacked, ten of which died and two recovered. In Ireland four outbreaks were reported; thirteen animals were attacked, all of which died.

SWINE FEVER.—This disease has been less prevalent during the past two months than it has been for years, only 440 fresh outbreaks being reported, as compared with 719 in the corresponding weeks of 1888 and 1889. The number of swine attacked was 2,633, of which 1,361 were killed, 1,082 diseased pigs died, 299 recovered, while 272 remained alive when the last return was made up. In Ireland thirty outbreaks of swine fever were reported and 75 pigs were attacked.

Mr. FOSTER said he had been unable to attend the Veterinary Committee, but he had been asked by the local authorities in Cumberland to make as strong a representation as possible on the subject of pleuro-pneumonia. The great difficulty they found in Cumberland, and no doubt in other counties, was not so much to stop the spread of the disease when it was detected as to detect it in the first instance, because of the impossibility of finding it out by inspection, no inspection being allowed. In the last outbreaks, some months elapsed before intimation of the existence of the disease was given to the police.

Mr. PELL explained the arrangements which had been made for the proposed deputation to Mr. Chaplin by a preliminary meeting of those intending to be present, held on the previous day.

Various details connected with the deputation having been discussed, Mr. DENT moved, the Duke of RICHMOND AND GORDON seconded, and it was resolved that the following six delegates be appointed to officially represent the Society at the deputation to Mr. Chaplin on the subject of pleuro-pneumonia, as recommended by the Veterinary Committee:—Lord Moreton (president), Sir Jacob Wilson, Mr. Bowen-Jones, Mr. Foster, Mr. Frankish, and Mr. Pell, attended by the Secretary.

Stock Prizes.

Mr. SANDAY reported his election as Chairman of the year. Acting upon the powers conferred upon them by the Council at its last meeting, the Sub-Committee had accepted and had authorised the insertion in the prize-sheet of prizes offered by the Hackney Horse Society, and the Shire Horse Society; of prizes for ponies, Kerries, and Dexter Kerries offered through the Plymouth Local Committee; and of champion prizes for Berkshire pigs offered by the British Berkshire Society.

An offer of champion prizes had been received from the Clydesdale Horse Society, and an offer of fourth and fifth prizes of 3*l.* and 2*l.* each from the Shropshire Sheep Breeders' Association for the Shropshire shearing ram and shearing ewe classes.

The Committee recommended the acceptance of the Clydesdale champion prizes, but were unable to accept the class prizes offered by the Shropshire Sheep Breeders' Association. They also recommended the acceptance and inclusion in the prize-sheet of the champion prizes offered for Short-horns by the Shorthorn Society.

Letters had been received from Devonshire exhibitors asking the Council to reconsider its decision as to the giving of prizes for hunter mares or geldings, and asking for separate classes for heavy and light weight-carrying hunters. As these prizes were not given by the Society the Committee had referred these letters to the General Plymouth Committee, but were ready, if thought well by the Plymouth Local Committee, to sanction the separation of the two classes in the prize sheet.

Judges' Selection.

Mr. SANDAY (chairman) reported that the Committee had selected a list of Judges of stock and produce to be invited to act at Plymouth in June next on the usual terms. The Committee recommended that a new list of Judges be obtained by nominations from members of the Society, the various Stud, Herd, and Flock-book Societies, and the principal breeders of the various classes of stock.

Implement.

Mr. FRANKISH reported his election as Chairman for the year. The Committee had considered and given directions respecting a variety of letters relating to implements at the Society's Shows which had been brought before them. The nature of the trials to be held in 1891 had been discussed, and it was unanimously agreed to recommend trials of threshing machines at the Society's Country Meeting next year. The Committee having considered the suggestion made by Mr. Gibbons at the General Meeting, "that in connection with the Country Meeting of 1891 the Society should institute trials of haymakers," recommended that the answer of the Council be that it was not proposed next year to institute trials of implements other than threshing machines.

General Plymouth.

Sir MASSY LOPES presented this report, which stated that the question of dividing the class (4) for six-year-old and five-year-old hunters into light-weights and weight-carriers had been discussed. The Committee recommended that, the Local Committee being willing to provide the extra prize-money (35%), the class be divided as suggested.

The prizes for hunters offered in connection with the Plymouth Meeting would then be as follows:—

Class	Hunters	Prizes		
		1st	2nd	3rd
1	Mare and Foal	£ 20	£ 10	£ 5
2	Filly foaled in 1887 . .	15	10	5
3	Filly foaled in 1888 . .	15	10	5
4	{ Mare or Gelding foaled in 1884 or 1885.	.	.	.
	(a) Light weight, up to 12 stone	20	10	5
	(b) Weight-carrier up to 15 stone	20	10	5
5	{ Mare or Gelding foaled in 1886	20	10	5

The Committee recommended the acceptance of the offer of the Shorthorn Society of two champion prizes of 25% each for the best male and the best female Shorthorn.

Showyard Works.

Sir JACOB WILSON reported his election as Chairman for the year, and that the works in connection with the Plymouth Showyard would be commenced this month. The Committee made various recommendations as to the acceptance of tenders for the supply of hurdles, and offers for the supply of a fire engine and appliances, and of the tiles for the roofing of the Dairy.

Selection.

Earl CATHCART reported his election as Chairman for the year. The Committee had considered the vacancy in the Council caused by the death of Mr. Wakefield, and in view of the necessity of filling up shortly a further vacancy, they had postponed any recommendation on the subject.

On the motion of Earl CATHCART, seconded by Sir JACOB WILSON, the Council conferred the honorary membership of the Society upon the Right Hon. Sir James Caird, K.C.B., in recognition of his distinguished services to agriculture.

Education.

Mr. DENT reported his election as Chairman. The Committee had considered communications from the Charity Commissioners, enclosing copies of draft schemes for the administration of two foundation schools, situated respectively at Woodbridge, in Suffolk, and West Lavington, in Wiltshire. The Commissioners inquired whether the Council would undertake the duty of appointing a Governor upon each foundation as provided for in the draft schemes, and they also invited any suggestions which the Council might think proper to offer on the clauses relating to agricultural education. With regard to the Woodbridge foundation it had been resolved, on the motion of Mr. Ransome, that Mr. Alfred J. Smith, of Rendlesham, Woodbridge, be recommended to the Council as the Society's representative Governor, to act so soon as the scheme should come into operation. The West Lavington scheme provided for the establishment of an agricultural school upon the lines of the Aspatria Agricultural College, and the Committee had accordingly given careful consideration to its provisions. They had made several suggestions for the improvement of the scheme, and had embodied them in a letter to be forwarded to the Commissioners. The Committee recommended that Lord Moreton be nominated to act as the Society's representative Governor upon this foundation when established.

The Committee had considered the suggestions relating to agricultural education which were made at the General Meeting last December, and presented the following recommendations as to the answers to be adopted.

Mr. W. R. ROBERTSON: *That more should be done by the Society for the advancement of agricultural education.*

This proposal is constantly receiving the attention of the Education Committee; but the Committee are not prepared at present to recommend any new departure. They will, however, consider carefully any definite suggestions on the subject that may be laid before them.

Mr. C. F. HOPE: *That the Society should institute or encourage a system*

of Travelling Lecturers for the instruction of farmers.

The Committee recommend that they be authorised to confer with any county or district associations desirous of establishing such lecture-ships, and to assist them by advice or otherwise.

Mr. W. LIPSCOMBE: *That the Society should prepare and issue diagrams of animals and things connected with agriculture, for use as object lessons for elementary scholars in rural districts.*

The further consideration of this suggestion, together with a reference as to magic-lantern slides from the Seeds and Plants Committee, was deferred.

Mr. DENT, referring to the suggestions relating to agricultural education which had been made by members of the Society, remarked that with respect to Mr. Robertson's suggestion, the Committee did not wish to throw cold water on any attempts to improve agricultural education. They considered the two schemes for the foundation of schools at West Lavington and Woodbridge, now under consideration by the Charity Commissioners, as steps in this direction which they would watch with very great interest; but at that moment they were not ready to recommend anything further to be done by the Society, as a society, in the way of encouraging agricultural education. At the same time, if friends of agricultural education would submit any definite views and schemes, and not simply say that more ought to be done by the Society for agricultural education, they would be ready to examine and look into such proposals, and give them their very best attention.

Mr. Hope had written several letters for the purpose of bringing forward the question of travelling lecturers. Mr. Hope had been working in Yorkshire, and it was stated that his lectures had been well received and fairly well attended. Again, in this case, the Education Committee did not think that it was for the Society to organise or establish agricultural lectures. But they did think that something might be done by the Council and the Education Committee

in the same way that the Chemical Committee had done with district Agricultural Societies and local experiments. Something might be done in the way of lectures on dairying or other agricultural subjects, and the Committee recommended that they be empowered to receive communications from county and district associations desirous of establishing such lectures, with a view to assistance being given to them by the Society either by advice or by a pecuniary grant.

The Committee had had before them two very important matters, viz., the two schemes drafted by the Charity Commissioners for the foundation of schools at Woodbridge, in Suffolk, and at West Lavington, in Wiltshire. The Woodbridge school was a grammar school already endowed, and it was proposed to add to it a modern side in which agriculture should be taught. The fees were to be 50*l.*, a sum which appeared too high for the ordinary farmer class. The Committee had no particular recommendations with regard to this scheme, because it appeared rather a higher class school, and apparently came up to the same level as the Colleges at Cirencester, Downton, Hollesley Bay, &c. The West Lavington scheme was to be started under a charity founded on the will of Ald. Dauntsey, dated 1543, yielding a maximum endowment of 2,000*l.* a year. The Commissioners proposed to devote a certain sum of money to the establishment of an elementary school, and about 1,300*l.* a year for an agricultural school on the same basis as the Aspatria Agricultural School, which might be preparatory for Cirencester College. This scheme was considered very carefully in Committee yesterday, and certain suggestions with respect to age, lodgings, fees to be charged, &c., were made. West Lavington was a district of large farms, but no doubt with a view to respect local feelings and prejudices—Alderman Dauntsey being a West Lavington man—it had been decided to start the first school, at all events, at West Lavington. To mark the Society's appreciation of the principle of this scheme, the Committee recommended that Lord More-

ton, President of the Society, should be nominated as the Society's representative Governor.

Earl CATHCART drew attention to the valuable information to be obtained from a recent Parliamentary Blue Book on Foreign Agricultural Departments respecting the travelling lectureships, which were a very essential feature in those Scandinavian countries which had made themselves such serious rivals to British agriculture. He suggested that this Blue Book should be noticed in the Journal.

Mr. BOWEN-JONES said that itinerant lectures were already established by the Board of Agriculture, and had been found very successful in some parts—North Wales, for instance. Professor Dobbie had given lectures in a number of towns, and they were attended largely by the farmers in the district. He thought this subject might be kept in view by the Society, and also that members of the Council might to a great extent make known the beautifully executed drawings of Miss Ormerod and her sister, issued by the Society, and cause them to be used for object lessons in the elementary schools. He believed it was partly owing to the fact that managers of these schools were not aware that such illustrations existed that they were not much used.

Dairy.

The Hon. CECIL T. PARKER announced that he had been appointed Chairman for the year, and that the Committee had had under consideration at their meeting yesterday the arrangements for the dairy at the Plymouth Show, and for the judging of the butter-making competitions and dairy appliances.

Hunter Stallion.

The Duke of RICHMOND AND GORDON announced that he had been elected Chairman for the year. The appointment of Judges and veterinary inspectors for the forthcoming Spring Show on March 4 to 7 had been left in the hands of the Royal Commission on Horse-breeding. Mr. T. H. Miller, as senior steward of stock, was appointed to act as steward at the Stallion Show on behalf of the Society.

Railway Rates.

Mr. FRANKISH drew attention to an appeal for additional funds issued by the Mansion House United Association on Railway Rates, and moved that a further grant of 50*l.* be made by the Society to the funds of the Association. He said that the railway companies had been a long time in considering their case; at the same time the money raised for the purpose of the defence was dwindling away and rapidly disappearing. As they were aware, Lord Moreton and himself had been asked to act on the Executive Committee of the Mansion House Association as representing the Society, and he asked the Council to place at their disposal a further sum of 50*l.* for such purpose. More money might be required to carry out the traders' case to the end, but he believed the traders were quite able to maintain their own interests. Having regard to the present position of affairs in agriculture, they wanted from the Society all the help that could be obtained.

Mr. SUTTON having seconded this motion,

Mr. DENT said he must demur to some of the statements by Mr. Frankish. It was not the railway companies that had been lengthening out the proceedings. Speaking as a railway director, he felt very strongly that this inquiry was being prolonged to a most inordinate length by associations of traders.

Further remarks having been made by Sir NIGEL KINGSCOTE and Mr. SUTTON,

Sir JACOB WILSON said he thought they should go back to first principles and remember what was the origin of this question. It was considered by the Council that the agriculturists of this country had a grievance, and when action was taken by the Lord Mayor it was thought that they should have their cause properly represented before the Committee. The Council then entrusted the matter to Lord Moreton and Mr. Frankish, and made them a grant of 50*l.* for the purpose. That sum was now found to be insufficient. They were there as the representatives of the farmers of England, and he thought that the

support of the Society should not now be withdrawn.

The grant of 50*l.* was then agreed to.

Country Meeting of 1891.

The SECRETARY read a letter from the Mayor of Doncaster, enclosing copy of a resolution passed by the Corporation of that borough, cordially inviting the Society to visit Doncaster in 1891, and announcing that the Corporation were willing to head the subscription list, and to give the free use of ninety acres on the Race Common for the purposes of the Show-yard. The Secretary added that as this invitation arrived at a time when the Inspection Committee for the Country Meeting of 1891 were assembled at Leeds for the purpose of inspecting the sites offered by the Corporation of that town, the Committee had decided to inspect the site offered by the Doncaster authorities on their way back to London. The Committee had inspected at Leeds two sites which had been selected by the local authorities, but as there were certain important matters connected with the railway arrangements for the settlement of which the companies must be consulted, it had been decided to recommend that the final decision should be postponed until the next meeting.

The action of the Committee was approved by the Council, and it was resolved to invite the authorities of both Leeds and Doncaster to attend the next meeting on March 5.

Country Meeting of 1892.

The SECRETARY read a letter from the Town Clerk of Warwick inviting the Society on behalf of the Corporation to take into consideration the advisability of selecting Warwick as the place of Country Meeting for the year 1892. The Secretary was instructed to thank the Town Council for its invitation, and to state that the question of the place of Country Meeting for the year 1892 would be taken into consideration after the autumn recess this year.

Date of Next Meeting.

Various letters having been read, the Council adjourned until Wednesday, March 5 next, at noon.

WEDNESDAY, MARCH 5, 1890.

LORD MORETON (PRESIDENT) IN THE CHAIR.

Present:

Trustees.—Earl Cathcart, Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., Earl of Powis, Sir Matthew White Ridley, Bart., M.P.

Vice-Presidents.—Earl of Feversham, Right Hon. Sir Massey Lopes, Bart., Sir John Thorold, Bart., Mr. C. Whitehead.

Other Members of Council.—Mr. G. M. Allender, Mr. J. H. Arkwright, Mr. J. Bowen-Jones, Mr. J. A. Caird, Mr. Chandos-Pole-Gell, Earl of Coventry, Mr. C. de L. F. De Laune, Viscount Emlyn, Mr. William Frankish, Mr. Hugh Gorringe, Mr. Anthony Hamond, Mr. James Hornsby, Mr. Charles Howard, Mr. C. S. Mainwaring, Mr. Joseph Martin, Hon. Cecil T. Parker, Mr. Albert Pell, Mr. Daniel Pidgeon, the Duke of Portland, Mr. J. E. Ransome, Mr. James Rawlence, Mr. Samuel Rowlandson, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. Henry Smith, the Marquis of Stafford, Mr. Martin J. Sutton, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. C. W. Wilson, Sir Jacob Wilson.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Mr. W. Caruthers, F.R.S., Consulting Botanist; Mr. E. W. Voelcker, Acting Consulting Chemist; Mr. Wilson Bennison, Surveyor.

The following members of the Plymouth Local Committee were also present: Mr. Edward St. Aubyn and Mr. R. B. Johns, Secretary of the Local Committee.

The minutes of the Council held on February 5 last were read and confirmed.

Surviving Members of the English Agricultural Society.

The PRESIDENT then observed that, before commencing the ordinary business of the day, he desired to recall for a few moments to the memory of

the Council the fact that that day was practically the end of the first half-century of the Society's corporate existence. On March 6, 1840, the Marquis of Normanby, who was then Secretary of State for the Home Department, wrote to the Duke of Richmond, as President of the English Agricultural Society, to acquaint his Grace that, having laid before Her Majesty the Queen the petition of the President, Trustees, Vice-Presidents, Governors, and Members of the English Agricultural Society, praying for Her Majesty's patronage of the Society, and also for a Charter, Her Majesty had been graciously pleased to comply with the prayer of the petition, both as to the patronage and grant of a Charter, and further to allow the Society to be called Royal. Although the actual date on which the Great Seal was affixed to the Charter was March 26, the Society might fairly regard itself as having been an incorporated body since March 6, 1840, and thus they met together that morning on what was virtually the last day of the Society's fiftieth year of existence as an incorporated body. He (Lord Moreton) was sure the Council would desire that on the completion of the Society's first half-century of life, those who happily survived of the original founders of the Society, and who were the pioneers of its successful working, should receive some small compliment at their hands. He had, therefore, the greatest pleasure in moving that the forty-two surviving subscribers to the English Agricultural Society who were on its books when the Charter was granted in March 1840, and who had been connected with the Royal Agricultural Society ever since, be elected FOUNDATION LIFE GOVERNORS of the Society. It would be gratifying to the Council to know that no less than three of its

own members were included in this honorary list, viz., the Duke of Devonshire, the Duke of Richmond, and Sir Thomas Acland, and one of its honorary officers, Professor Simonds, besides a member of the original Committee, Sir Harry Verney, the "Father" of the Society, who was now the only survivor of the band of eminent men who gathered together on May 9, 1838, to found the English Agricultural Society. In submitting his motion to the favourable and unanimous approval of the Council, he would only add that at present there were upon the Society's books 177 Governors and 10,752 Members, making a total number of 10,929 subscribers, which, allowing for the considerable reductions from the nominal list which were made last autumn in consequence of the absence of addresses, &c., was by far the largest number which the Society had ever had at any period of its history. (Hear, hear.)

The motion was then put from the chair, and carried unanimously.

Surviving Subscribers of the English Agricultural Society who were on the Books when the Charter was granted on March 26, 1840.

	Date of joining the Society.
VERNEY, Rt. Hon. Sir Harry, Bart.	May 10, 1838
DEVONSHIRE, Duke of, K.G.	May 12, 1838
GREY, Earl, K.G.	May 12, 1838
WINMARLEIGH, Lord	May 12, 1838
RUSSELL, Lord C. J. F.	May 26, 1838
ACLAND, Rt. Hon. Sir T. Dyke, Bart.	May 26, 1838
BROG, Thomas	June 6, 1838
SPARKE, William	June 6, 1838
HUTCH, Col. Sir Edward, Bart.	June 13, 1838
SAUNDERS, T. B.	June 13, 1838
RICHMOND AND GORDON, Duke of, K.G.	June 20, 1838
LOVELACE, Earl of	June 23, 1838
DICKINSON, F. H.	June 27, 1838
BAILLIE, W. Hunter	July 13, 1838
SIMONDS, Prof. J. B.	July 25, 1838
MACCLESFIELD, Earl of	Aug. 8, 1838
WOOD, James	Aug. 8, 1838
CLUTTON, John	Dec. 15, 1838
CALVERT, Frederick, Q.C.	Feb. 13, 1839
ELLMAN, Robert H.	Feb. 13, 1839
HOLFORD, R. S.	Feb. 13, 1839
NEANE, Frederick	Feb. 13, 1839
PINNEY, Col. William	Mar. 13, 1839
NORF, Rt. Hon. Col. J. S.	May 8, 1839
DRUCE, Joseph	May 13, 1839
STRATTON, J. Locke	May 13, 1839
MONCK, J. Bligh	May 23, 1839
MORRELL, F. J.	May 28, 1839
SIMONDS, W. Barrow	June 13, 1839
SMITH, Henry	June 19, 1839

	Date of joining the Society.
KEMBLE, Thomas	July 10, 1839
BATTEN, John	July 16, 1839
KEMBLE, Horatio	July 16, 1839
RODD, F.	July 16, 1839
GREAVES, William	Dec. 4, 1839
ESSEX, Earl of	Dec. 11, 1839
EVANS, Isaac Pearson	Dec. 11, 1839
GLOVER, John	Jan. 10, 1840
HOUBLON, R. Archer	Jan. 10, 1840
OGILVY, Sir John, Bart.	Feb. 5, 1840
FLETCHER, John P.	Feb. 13, 1840
DREWITT, R. Dawtreay	Mar. 11, 1840

The following is a copy of the letter addressed by the President on behalf of the Council to the noblemen and gentlemen elected as Foundation Life Governors:—

12 Hanover Square, London, W.
March 5, 1890.

Sir,—As the Council Meeting held to-day was the last held in the first half-century of the Society's corporate existence, the Council resolved by an unanimous vote to elect as FOUNDATION LIFE GOVERNORS of the Society all the surviving subscribers to the original English Agricultural Society who were on its books when the Charter was granted to it on March 26, 1840, and who have been connected with the Royal Agricultural Society ever since.

As your name appears in the list of Original Members, I have the pleasure to acquaint you with your election to-day as one of its FOUNDATION LIFE GOVERNORS; and I am happy in being the medium of expressing to you the congratulations of the Council on your long association with the Society, and their hopes that you may be spared for many years to exercise the privileges of a Life Governor.

Believe me, yours faithfully,
(Signed) MORETON, President.

Medallion of the Third Earl Spencer.

The PRESIDENT said he had also the pleasure to announce that Mr. Leonard C. Wyon, the Society's Medallist, and son of the equally eminent Mr. William Wyon, R.A., had, in view of the approaching completion of the Society's fiftieth year, most kindly presented to it the original model of the founder of the Society, Lord Spencer, which Mr. W. Wyon took at Althorp in the year

1841. This, as they would see, had obvious traces of Mr. Wyon's master-hand upon it, and it was the original from which the Smithfield Club medal and other medallions of Lord Spencer had been taken.¹ The model would be hung up on the walls of the Council-room with the other portraits of the early founders of the Society, and he was sure the Council would wish him to express to Mr. Wyon the Society's thanks for his most handsome and acceptable gift. (Hear, hear.)

Election of New Governors and Members.

The election of the following seven Governors and thirty-nine Members was then proceeded with:—

Governors.

DERBY, Earl of, K. G. Knowsley, Prescott.
LUTTRELL, Col. H. A. F., C.B. Badgworth Court, Axbridge.
MAPLE, John. Bedford Lodge, Haverstock Hill, N.W.
MOUNT-EDGUMBE, Earl of. Mount Edgumbe, Plymouth.
PEEL, Edmund. Brynypys, Ruabon.
PORTMAN, Viscount. Durweston, Blandford.
SALT, Sir W. H., Bart. Maplewell, Loughborough.

Members.

ARNOTT, David Taylor. Woodlands, co. Cork.
BAKER, W. S. Bowman Hill House, Stone, Dartford.
BEAR, Horace. Maidstone, Kent.
BOUYERIE, Hon. D. P. Coleahill House, Highworth.
BRENTON, George Henry. St. Germans, Cornwall.
BUTCHER, Charles. Maethendra, Glasbury, Brecon.
CAMPHILL, Hon. Alex. F. H. Symonds Yat, Ross.
CAPON, G. G. 63 Mortimer St., Regent St., W.
CASH, Edwin. St. John's College, Cambridge.
CURTIS, P. F. Stratford-sub-Castle, Salisbury.
ELNOR, Thomas. Stoke Bardolph, Nottingham.
FORSTER, Stuart. Newton, near Faringdon, Berks.
GIBLING, John W. Thorington Hall, Essex.
GLENDALE, A. Four Oaks Farm, Sutton Coldfield.
GUERNSEY ROYAL AGRICULTURAL AND HORTICULTURAL SOCIETY, Guernsey.
HOLMAN, A. F. 5 Cambridge Terrace, Torpoint, Devonport.
KENT, A. U. Coin St., Aldwyns, Fairford, Glos.
LAW, B. W. Stanell, Tickhill, near Rotherham.
MASSEY, F. L. 54 and 55 Bunhill Row, E.C.
MAY, O. O. Sutton's Gate, Hornchurch, Essex.
MEAKIN, G. Branstone Road, Burton-on-Trent.
MIDDLETON, H. Hampole Manor, Doncaster.

MILLS, F. The Rookery, Orcheston St. Mary, Devizes.
MORET Y PRENDERGAST, Don Segismundo. 4 Blanca de Navarra, Madrid.
MUSKER, J. H. The Greys Farm, Westerham Hill, Kent.
PERROTT, T. Kynaston, Bronhyddon, Oswestry.
READE, Joseph. 11 Old Square, Lincoln's Inn, W.C.
SICH, Arthur John. Waltham Lodge, Chiswick.
STOCKS, F. W. Downham, Clitheroe.
THORBURN, J. D. Hearthstones, Bromborough, Cheshire.
TOWNSEND, Richard. Thanet House, Stroud.
WARING, H. F. The Limes, Maidstone.
WEDDEL, William. 16 St. Helen's Place, E.C.
WELSBY, Thomas. Southport, Lancashire.
WHEATLEY, W. J. Gilling Grange, Richmond, Yorks.
WHIDLER, J. M. Raven's Farm, Little Easton, Dunmow.
WILLIAMS, William. Whitstone, Cornwall.
WOOD, J. A. 8 Severn Road, Weston-super-Mare.
YOUNGMAN, George. Lenfield, Maidstone.

The reports of the several Committees were then presented and adopted as below:—

Finance.

Sir NIGEL KINGSNOTE (Chairman) reported that the accounts for the month of February, as certified by the Society's accountants, showed receipts for that period amounting to 674*l.* 0*s.* 9*d.*, and expenditure 981*l.* 14*s.* 10*d.* The balance at the bankers on February 28, allowing for cheques outstanding, was 6,933*l.* 12*s.* 1*d.* Accounts amounting in all to 1,875*l.* 1*s.* were recommended for payment. The Committee recommended that Messrs. Frankish and Sanday be appointed Stewards of Finance at the Plymouth Meeting, and that the names of four life and five annual members who are deceased, thirteen members who have resigned, and three whose addresses cannot be found, be struck off the Society's books; also that two members struck off who have paid up their arrears be restored to the register.

Journal.

Earl CATHCART (Chairman) reported that Mr. de Laune had been added to the Committee. Various points connected with the new Journal had been discussed, and final arrangements made as to its production. The price to non-members of each number had been fixed at 3*s.* 6*d.* per copy.

¹ A copy of this model appears in the Memoir of Earl Spencer, on page 138 of the present number.

Chemical.

Viscount EMLYN presented the Quarterly Report of the Chemical Committee, which was adopted and ordered to be published (see p. 192.)

Seeds and Plant Diseases.

Mr. WHITEHEAD (Chairman) presented a report by the Society's Consulting Entomologist, which was ordered to be published.¹

Veterinary.

Sir JOHN THOROLD (Chairman) reported that Professor Brown had presented the following report:—

PLEURO-PNEUMONIA.—During the four weeks ending February 22nd there were twenty-six fresh outbreaks of this disease reported in Great Britain. Fourteen of these were in England, in the counties of Bucks, Chester, Cumberland, Lancaster, Middlesex, and York (West Riding); the twelve outbreaks in Scotland occurred in the counties of Aberdeen, Ayr, Edinburgh, Fife, Forfar, and Perth. The total number of cattle attacked was 175, of which seventy-nine were in England and ninety-six in Scotland. The number of healthy cattle slaughtered as having been exposed to infection was 355, of which 128 were in England, and 227 in Scotland. In Ireland, during the four weeks, ten fresh outbreaks of pleuro-pneumonia were reported—nine of them in North Dublin, and one in South Dublin; forty-two cattle were attacked, and 152 healthy cattle in contact with the disease were slaughtered.

ANTHRAX.—In Great Britain there were seventeen fresh outbreaks of this disease reported in the four weeks. Sixteen of these occurred in England, in the counties of Devon, Durham, Lancaster, Leicester, Lincoln (Lindsey), Norfolk, Northampton, Oxford, Somerset, Sussex (East), York (North

Riding), and York (West Riding); the outbreak in Scotland took place in Forfarshire. The number of animals attacked with anthrax was twenty-six; of these diseased animals, one was killed and twenty-five died. No fresh outbreak of anthrax occurred in Ireland during the four weeks, but two animals were attacked and died on premises where the disease had previously existed. In three cases of outbreaks of anthrax in Northamptonshire and one in Somerset, Professor Penberthy, of the Royal Veterinary College, has carried out a system of protective inoculation. Altogether 165 cattle were inoculated in Northamptonshire, and thirty-five in Somerset. At the present time only one case of death has been recorded in the inoculated herds, and in this instance inoculation of rabbits with the blood of the dead animal did not produce anthrax. The results are altogether satisfactory as far as they go, but no definite conclusion can at present be drawn, because outbreaks of anthrax in this country commonly cease after the loss of one or two animals without the employment of any protective inoculation for the remainder.

SWINE-FEVER.—There were 201 fresh outbreaks of swine-fever reported in Great Britain during the four weeks; 937 swine were attacked, 454 diseased pigs were killed, 405 died, ninety-three recovered, and 254 remained alive at the end of the week. In Ireland twenty fresh outbreaks were returned, and forty-six pigs were attacked.

RABIES.—In England there were fourteen cases of rabies in dogs during the four weeks. They occurred in the counties of Chester, Hants, Leicester, London, Surrey, and York (W.R.). In Ireland there were fourteen cases of rabies, twelve in dogs, in the counties of Antrim, Carlow, Cork, Limerick, Londonderry, Queen's Co., Roscommon, and Wicklow; the other two cases were in cattle in co. Cork.

DISEASES IN CATTLE AND SHEEP IN DERBYSHIRE.—Mr. W. Aulton, district veterinary surgeon, reports that parturient apoplexy (drooping

¹ This report is embodied in the Report of the Consulting Entomologist, printed on pages 170 to 184.

after calving) has lately occurred almost daily among cows in his district; fifteen cases came under his observation in less than one week. The treatment adopted has been fairly successful, the recoveries amounting to sixty per cent. Mr. Aulton remarks on the serious effects of the sudden wintry weather on sheep and lambing ewes; numerous losses have resulted from catarrhal pneumonia with spinal disorder.

The Committee had considered the report of the Sub-Committee of the Conference on Horse Shoeing appointed in December last, and the Draft Scheme for the Examination and Registration of Farriers as Shoeing Smiths prepared by the Worshipful Company of Farriers, and amended by the representatives of the Worshipful Company, of the Royal College of Veterinary Surgeons, and of the Royal Agricultural Society of England. This scheme and the report of the Sub-Committee having been previously circulated among the members of the Council, it had, on the motion of Mr. Pell, seconded by Professor Axe, been resolved to recommend the adoption by the Council of the scheme as at present printed.¹ The Examiners on the diseases of animals of the farm other than the horse in the examinations for the diploma of the Royal College of Veterinary Surgeons held last year had reported that the following gentlemen have attained the greatest distinction:—

1. Mr. H. H. MILLWARD, Mareham-le-Fen, Lincolnshire.
2. Mr. J. GOLLEDGE, Whaddon Grove, Trowbridge.

The Committee recommended that the Society's large medal be given in silver to Mr. Millward, and in bronze to Mr. Gollidge. They also recommended the payment to the Royal Veterinary College of the first quarterly instalment of the Society's grant of 500*l*. Applications for appointment as the Society's provincial veterinary surgeons (1) from Mr. Robert Roberts, of 30 Bridge Street, Wrexham, for the county of Flint, and (2) from Professor W. T. Wilson, of the Royal

Agricultural College, Cirencester, for the county of Gloucester, in succession to Professor Almond, had been acceded to.

Stock Prizes.

Mr. SANDAY (Chairman) reported that a letter had been received from Mr. Robert Thompson, the owner of the first-prize winner, Belle Madeline, in Class 80 at the Windsor Meeting, from which it appeared that this cow had not complied with Regulation 49 of the prize-sheet. The following were the animals which, in consequence of the above-mentioned disqualification, succeeded to the prizes, being duly qualified therefor, and the Committee recommended that cheques be drawn in favour of their exhibitors:—

First prize of 20*l*. to Lord Polwarth, for *Wave of Loch Leven*. [Awarded second prize.]

Second prize of 10*l*. to Mr. C. W. Brierley, for *Marchioness of Waterloo* 6th. [Awarded third prize.]

Third prize of 5*l*. to Mr. Thomas Stokes, for *Autumn Rose*. [Reserve number.]

Judges' Selection.

Mr. SANDAY (Chairman) reported that, with very few exceptions, the invitations to judge at Plymouth had been accepted, and the necessary instructions had been given for the completion of the list.

Implement.

Mr. FRANKISH (Chairman) presented the Report of this Committee, which stated that Mr. J. H. Knight, of Barfield, Farnham, had drawn the attention of the Society to an error in the records of the trials of his petroleum engine during the Windsor Show last year, and the Committee recommended that the following report, which had been received from the Consulting Engineers, be published in the Proceedings of the Council, in order that the Society might take the earliest opportunity of correcting the error which had unfortunately occurred:—

"An investigation of the case shows that a clerical error has been committed on the part of the

¹ See page 213.

engineers in reducing their experiments. The consumption of oil was stated as 3.54 per brake horse-power, whereas it really worked out 2.4 per brake horse-power. This would not, however, have affected the awards as made at the Windsor Meeting."

The Committee had given further consideration to the subject of the proposed trials of Threshing-machines in connection with the Meeting of 1891, and recommended that three prizes of 100*l.*, 50*l.*, and 25*l.* respectively be offered for the best Threshing-machines. It was proposed that these trials should take place in June 1891, before the opening of the Show.

General Plymouth.

Sir MASSEY LOPES reported that the Local Committee were taking steps with regard to various matters connected with the forthcoming Meeting, including the preparation of an official list of lodgings. The Committee recommended that the services of a military band be secured for the Show week, and that the usual application be made to the Home Secretary for the services of a detachment of the metropolitan police.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that Mr. Bennison had taken possession of a part of the Show ground at Plymouth, and had commenced fixing the offices and outer fencing. The Committee had considered the tenders for the supply of refreshments at Plymouth, and presented their recommendations thereon.

Committee of Selection.

Earl CATHCART (Chairman) reported that Mr. Sanday having become an *ex-officio* member of the Committee, by virtue of his Chairmanship of the Stock Prizes Committee, the Committee recommended that Mr. Stratton be added to their number as an elected member. The Committee presented their recommendation of a new member of Council in the room of Mr. Chaplin, elected a Vice-President, and had postponed until the next meeting their recommendation as to the filling up of the vacancy

caused by the death of Mr. Herbert J. Little.

Hunter Stallion.

Mr. SANDAY reported that the judges at the Stallion Show held that week had awarded the three premiums of 200*l.* and Gold Medals, offered by the Society in Class D, to Mr. G. P. Finch, of Alphington, Exeter, for *Eclipse* (No. 43); to Mr. Isaac Clark, of Headington, Calne, for *Jack Tar* (No. 47); and to Mr. Alex. Taylor, of Manton, Marlborough, for *Lancastrian* (No. 48).

The Committee recommended that these stallions should be stationed during the present season as follows:—*Eclipse* in the Exeter District at his owner's stables, The Briars, Alphington, Exeter, *Jack Tar* in the Plymouth District, and *Lancastrian* in the Windsor District, at the South Lea Farm, Datchet; that the period of service should be from March 20 to June 20; and that the owners of mares in the districts in which the stallions were stationed should have a prior claim to nominations up to Monday, the 17th instant.

Country Meeting of 1891.

Mr. GORRINGE read the report unanimously agreed upon by the members of the Inspection Committee on the results of their inspection of the sites offered at Leeds and Doncaster.

Withdrawal of the Invitation from Leeds.

The Mayor of LEEDS (Mr. Alderman Emsley), accompanied by Mr. Reginald Wigram, the Honorary Secretary of the Local Committee, attended the Council for the purpose of personally explaining the circumstances under which the Corporation felt themselves compelled to withdraw their invitation to the Society to hold its Country Meeting of 1891 in that town. His Worship said that in December last the Corporation had sent an invitation to the Society to hold the Show of next year at Leeds. The townspeople had taken up the matter with great spirit, and they had contemplated almost as a certainty the holding of the Show in their midst. The meeting of the Royal

Agricultural Society had not been held in their town since the year 1861. That occasion was a great success, and they thought that, as the population since that time had nearly doubled, and everything had succeeded most prosperously with them, they should next year—at all events with regard to the attendance—have overtopped any Show which the Society had held up to that time, and there was not the slightest doubt that they would have done so. A Local Committee and a surveyor were appointed to look out for sites, and on February 1 the members of the Committee of Inspection accompanied the Local Committee over the whole of the sites which up to that time they could recommend. They went firstly to a site which was satisfactory so far as regarded the situation, but which, in the general opinion of the Committee, appeared almost to be despaired of in consequence of the unevenness of the land, and because of its having a ditch of great breadth running right through it. The other site inspected was at Haigh Park, on the Leeds and Pontefract road, about three miles from the town. The great objection to that site was that, being three miles out of the town, and being outside the borough, they could not expect that attendance of the public which there would be in a site nearer the town. Besides this, there was but one road to it, and the only railway near was the Midland.

It appeared that the owner had now an offer for this estate, and had not been able up to the present time to give them a promise that they could have the land, even if the Society would take it. After the visit of the Committee, they had to see if they could obtain another site. The place where the Show was held in 1861 was Cardigan Fields, about a mile from the town, admirably situated; but, unfortunately, owing to the expansion of Leeds, it had now dwindled down to 29 acres, which evidently was insufficient for the Society's requirements. It had been bought for building purposes, and he was asked a rent for the 29 acres of 2,000*l*. In view of their getting Cardigan Fields upon these terms, they had gone across the river Aire,

and had asked for permission to use land on the other side for the purpose. As to the question of cost, it was found that, with the 2,000*l*. they would have to pay the owner of the land for the Cardigan Fields, and with the cost of putting a bridge over the river, a total minimum expense of 9,000*l*. would be incurred. They considered this a very large sum, and the General Committee had passed a resolution, which they had asked him (the Mayor) and Mr. Wigram to come personally to explain to-day. The resolution was to the effect that, the Cardigan Fields being only obtainable at a very considerable cost for the purpose of the Royal Agricultural Society's Meeting of 1891, the Committee did not feel justified in recommending it, and that being the only site likely to meet with the approbation of the Society, the Committee abandoned the hope of receiving the Society as originally proposed. They trusted that Doncaster would have a good meeting, and they would do all they could to assist them. (Hear, hear.)

Sir JACOB WILSON said he was sure it would be the pleasure of the Council that the Mayor of Leeds and Mr. Wigram should not leave that room without a vote of thanks being accorded to them for their courtesy and kindness in receiving the Committee at Leeds, and in coming personally to explain the decision at which the Local Committee had arrived. He had very vivid recollections, as Lord Powis would have, of their successful visit at Leeds thirty years ago, and he had looked forward for very many years to a repetition of that visit. However, as circumstances stood, he was perfectly sure that the best course had been taken, though it was a source of deep regret to many of them in that room. He had great pleasure in moving a vote of thanks to the Mayor of Leeds for his efforts on behalf of the Society, and for his attendance that day.

The Earl of Powis said that, as President of the Society for the year 1861, when the Society first visited the town of Leeds, he might perhaps be allowed to second the motion of Sir Jacob Wilson. He had no better wish for the Meeting of the Society

in Yorkshire than that the weather should be as fine, and the numbers of those who attended equal to that occasion, when 73,821 people passed the turnstiles in one day. Indeed, they came in so quickly in the middle of the day by the excursion trains, that they were obliged to give up passing them through the turnstiles, and Colonel Challoner and Lord Bridport got a washing-tub, and sat on chairs on each side of it, whilst the people tossed their shillings in as they went by through the open gates.

Mr. GORRINGE, as senior steward of implements, said he felt bound to endorse all that Sir Jacob had expressed as to the great courtesy shown them by the Mayor and Corporation of Leeds.

The PRESIDENT expressed the feeling of regret with which the Council had heard the Mayor's communication, and his own sense of the kindness and hospitality which the Mayor and his colleagues had shown them when they visited Leeds the other day. He regretted that they would not see so much of them as they would have done had they gone to Leeds, but if the Mayor and the other gentlemen would condescend to visit them at Doncaster, he was sure they would do their best to return the hospitality which they had received.

The Mayor of LEEDS said he was very much obliged to the Council, and the only reason for the withdrawal of the invitation was the great prosperity of the town of Leeds.

His Worship and Mr. Wigram then withdrew.

Invitation from Doncaster.

The Earl of FEVERSHAM then introduced a deputation from Doncaster, consisting of the following gentlemen:—The Earl of Wharnccliffe, the Hon. H. W. Fitzwilliam, M.P., the Mayor of Doncaster, Col. St. Leger, Mr. C. E. S. Cooke, Mr. F. J. S. Foljambe, Mr. F. B. Frank, Mr. R. J. Streetfield, Mr. G. B. C. Yarborough, Mr. Alderman Bentley, Mr. Alderman Smith, Mr. Alderman Stockil (Chairman of the Race Committee), Mr. T. Anelay (Borough Steward), and Mr. G. Chafer (Local Secretary).

The Earl of WHARNCLIFFE said

he had the honour to represent Doncaster, as being a resident landowner of the locality, and he thought, perhaps, the nearest landowner to the town. They regretted very much to say that they were deprived that day of the presence of a neighbour whose loss by death they all deeply deplored, and who had been of the greatest possible assistance to them. He referred to Lord Auckland, who, although known to all of them for a very long time, could not have been valued half so highly as by those in the neighbourhood. He would call upon the Mayor, who was fully cognisant of the facts and figures, to make the statement which he had to communicate.

The Mayor of DONCASTER (Mr. J. Firth Clark) said he had, on behalf of the Corporation of Doncaster, and of a very large and influential public meeting of landowners, manufacturers, and others, to give the Society a very hearty invitation to hold their Meeting at Doncaster in 1891. Lord Wharnccliffe had spoken of the influential character of the deputation, and he counted it an honour to speak on their behalf, to give the Society the invitation, and to lay the necessary facts before the Council. It was proposed to hold the Show on their well-known racecourse called the Town Moor. Most of them would agree that this site could not be surpassed, probably hardly equalled, in Yorkshire for the proposed Show, and the Corporation offered ninety acres of that course for the purpose. The Inspection Committee had seen the site, and should be able to judge of its capabilities. It was surrounded by farms, and a good deal of the land adjacent was also the property of the Corporation. The site, too, was a very beautiful one, and an attraction in itself to bring visitors to the town. The approach from the town was a very broad, even one, lined with magnificent trees, and so wide that four lines of carriages could be driven abreast; and there was also a broad approach from the station to the town. In addition, the town could offer a number of hotels for the accommodation of visitors. The inhabitants of the town were accustomed to provide for a very large influx of visitors every year.

Thousands of people came to stay at Doncaster for days together. Many of the inhabitants threw open their houses for the convenience of visitors, and no doubt that practice would be greatly extended on the occasion of the Royal Show. Then they had accommodation in Doncaster for as many as 700 or 800 horses. That, he thought, was an item which would interest them, and which would be satisfactory to know. At the Doncaster railway station there was abundance of accommodation for all the traffic. Perhaps nowhere else were the officials so accustomed to deal with a large amount of concentrated traffic as at Doncaster during the race week, and at the same time keep up the ordinary traffic with punctuality and despatch. Each of the principal railway companies of the kingdom ran into the railway station at Doncaster. The railway companies could provide ample accommodation for the goods traffic. Special docks for heavy machinery would be provided, and they had docks for the unloading of a whole trainload of animals at a time. The population of Doncaster was 35,000; but he wished to point out that within a radius of twenty miles were the towns of Gainsborough, Botherham, Dewsbury, Barnsley, Pontefract, Wakefield, Goole, &c., which made up a population of 600,000, and that within a radius of forty or fifty miles there were the great manufacturing towns of Hull, Leeds, York, Bradford, and the other towns in the West Riding. Moreover, Doncaster was a splendid agricultural district. Its corn, cattle, and general produce markets attracted an enormous number of those interested in agricultural pursuits every Saturday, and upon those markets the people of Doncaster had spent no less than 70,000*l.*, not counting the sites. They were prepared to fulfil the conditions laid down by the Society before a town could be honoured by being chosen for the Show. The list of subscriptions which had been laid upon the table showed that a sum of nearly 4,000*l.* had been collected towards the expenses, 500*l.* of which had been promised by the Doncaster Agricultural Society, who in the event of the

Royal Show being held at Doncaster had decided cordially and unanimously to give up their own Show. Their local society, though not a county one, was larger than a good many county societies, and had a larger number of subscribers. The Corporation had voted 500 guineas to the local fund. The cost of the site would not have to be paid for out of the local fund, and probably 700*l.* or 800*l.* would represent the expenditure of the Doncaster Committee for the purposes of the Show. The subscription list was headed by all the local bankers with very handsome subscriptions, and by noblemen and gentlemen, who had come forward in the matter most cordially and liberally; and it was supported by tradesmen of all classes according to their means. They had only had three weeks to work in, or the subscription list would have been considerably increased, and there was no doubt that it would be considerably increased during the next few months. They had communicated with the Council of the Yorkshire Society as to their giving up their Show next year. He was not able to say that they would, but they would do their utmost to induce them to do so. In conclusion, his Worship repeated the most warm invitation of the Corporation and inhabitants of the town of Doncaster. They felt that the Society would be conferring upon them an honour in accepting their invitation, which both the Corporation and the neighbourhood would appreciate by doing their utmost to further the interests of the Society. They believed that the Show would add to the Society's permanent subscription list, and if they came to Doncaster he thought the Society would be able to look back upon its visit as one of the most successful Shows which it had ever held.

The Hon. H. W. FITZWILLIAM, M.P., said he would not waste time by reiterating what had been said by the Mayor, but on behalf of the local residents he could assure the Society of a most cordial invitation to Doncaster and the district.

Mr. F. B. FRANK, as a member of the Council of the Yorkshire Agricultural Society, said as at present

arranged the Yorkshire Society would hold its Show, if held at all, quite in the north part of the North Riding. Whether they would or would not forego their Show in 1891 he could not say, but they had taken this course before. When the "Royal" last held its Show at York, in 1883, they gave up their own Show, and subscribed 800*l.* towards the local fund. He did not know whether they would subscribe or give up their Show upon the present occasion, but he had undertaken to bring the subject before their Council at their next meeting on April 3. He could only say, on behalf of themselves as landowners in the neighbourhood, how glad they would be to see the Society. They would do their best to make the Show a success. They could not possibly in all England have better ground, better railway accommodation, or better railway management.

The PRESIDENT said the statement of the Mayor was so clear and complete that he had only one question to ask—viz., the amount likely to be given for the local prizes. He did not know whether that point had been considered.

The MAYOR replied that they proposed to devote the 500*l.* from the local agricultural society as the nucleus of a special prize list; and they were prepared to augment that by at least 500*l.* more. In all probability the sum would be more than 1,000*l.*, because of the ground being already prepared and gas and water laid on to the grand stand on the race common. His Worship added that the Chairman of the Race Committee had authorised him to say, on behalf of the Committee, that the offices at the grand stand for telegraphing and for reporters, and the dining-room fitted up with cooking apparatus, would be placed at the disposal of the Council, which would greatly increase their personal convenience.

The Earl of POWIS said the Council would not trouble the deputation to retire, but had placed in his hands the following resolution, which

he had great pleasure in moving:—
"That the Country Meeting of 1891 be held at Doncaster, subject to the customary condition that the usual agreement be entered into by the Mayor and Corporation with the Society, such agreement to embody the answers to the printed queries and the verbal answers to the questions asked of the deputation." He thought that Doncaster was a place eminently suited for a meeting of the Society. Leeds represented the great manufacturing and industrial interests of the West Riding. Doncaster—surrounded as it was by good farms and good land—might claim, as the Mayor had said, to represent the agricultural (and might he add the sporting?) characteristics of the county. As they were all agreed upon that point, it was not necessary for him to dilate any longer on the advantages of choosing Doncaster. He could only hope that when they met there the weather might be as suitable and the receipts as large as at Leeds in 1861, when he had the honour of being President of the Society.

Sir JACOB WILSON seconded the resolution, remarking that he did so from a firm belief that Doncaster possessed all the requirements of the Society for the Show.

The resolution was then unanimously passed, and the PRESIDENT formally announced it to the Mayor, at the same time expressing the thanks of the Council for the courtesy of the deputation in attending there that day.

The MAYOR, in reply, stated that the deputation were very much honoured and pleased by the resolution which had been passed, and he would only repeat that they would do their utmost to make the Show a success. He echoed Lord Powis's wish that the Show might be as great a success in regard to weather and finances as at Leeds in 1861.

The deputation then withdrew.

Date of Next Meeting.

Other formal business having been transacted, the Council adjourned until Wednesday, April 2, at noon,

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The Society is indebted to the Editors of numerous other agricultural and general papers for the current numbers of their publications, which have been placed for reference in the Reading Room.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Governors' Members' Privileges of Chemical Analysis.

(Applicable only to the case of Persons who are not commercially engaged in the manufacture or sale of any substance sent for Analysis.)

THE Council have fixed the following rates of Charges for Chemical Analysis to Members of the Society.

These privileges are applicable only when the Analyses are for *bond-fide* agricultural purposes, and are required by Members of the Society for their own use and guidance in respect of farms or land in their own occupation and within the United Kingdom.

The analyses are given on the understanding that they are required for the individual and sole benefit of the Member applying for them, and must not be used for other persons, or for commercial purposes.

Land or estate agents, bailiffs, and others, when forwarding samples, are required to state the names of those members on whose behalf they apply.

Members of the Society also have the privilege of sending samples for analysis on behalf of any farming company of which they may be directors or managers, provided that the substances so sent shall be for use on the farm of the company, and not for sale to other persons.

Members are also allowed to send for analysis under these privileges any manures or feeding-stuffs to be used by their outgoing tenants, or which are to be given free of cost to their occupying tenants.

The analyses and reports may not be communicated to either vendor or manufacturer, except in cases of dispute.

Members are requested, when applying for an analysis, to quote the number in the subjoined schedule under which they wish it to be made.

The fees for analysis must be sent to the Consulting Chemist at the time of application.

No.		
1.	An opinion of the purity of bone-dust or oil-cake (each sample)	2s. 6d.
2.	An analysis of sulphate or muriate of ammonia, or of nitrate of soda, together with an opinion as to whether it be worth the price charged	5s.
3.	An analysis of guano; showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts and ammonia, together with an opinion as to whether it be worth the price charged	10s.
4.	An analysis of mineral superphosphate of lime for soluble phosphates only, together with an opinion as to whether it be worth the price charged	5s.
5.	An analysis of superphosphate of lime, dissolved bones, &c., showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime, and ammonia, together with an opinion as to whether it be worth the price charged	10s.
6.	An analysis of bone-dust, or any other ordinary artificial manure, together with an opinion as to whether it be worth the price charged	10s.
7.	An analysis of compound artificial manures, animal products, refuse substances used for manure, &c.	from 10s. to £1
8.	An analysis of limestone, showing the proportion of lime	7s. 6d.
9.	An analysis of limestone, showing the proportion of lime and magnesia	10s.
10.	An analysis of limestone or marl, showing the proportion of carbonate, phosphate, and sulphate of lime and magnesia, with sand and clay	10s.
11.	Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	10s.
12.	Complete analysis of a soil	£3
13.	An analysis of oil-cake or other substance used for feeding purposes, showing the proportion of moisture, oil, mineral matter, albuminous matter, and woody fibre, as well as of starch, gum, and sugar in the aggregate; and an opinion of its feeding and fattening or milk-producing properties	10s.
14.	Analysis of any vegetable product	10s.
15.	Determination of the "hardness" of a sample of water before and after boiling	5s.
16.	Analysis of water of land-drainage, and of water used for irrigation	£1
17.	Analysis of water used for domestic purposes	£1 10s.
18.	An analysis of milk (to assist Members in the management of their Dairies and Herds, <i>bond-fide</i> for their own information and not for trade purposes, nor for use in connection with the Sale of Food and Drugs Acts)	5s.
19.	Personal consultation with the Consulting Chemist. (To prevent disappointment it is suggested that Members desiring to hold a consultation with the Consulting Chemist should write to make an appointment).	5s.
20.	Consultation by letter	5s.
21.	Consultation necessitating the writing of three or more letters	15s.

Letters and samples (postage and carriage prepaid) should be addressed to the Consulting Chemist, Dr. J. AUGUSTUS VOSELOKKE, 13 Hanover Square, London, W. Cheques and Postal Orders should be crossed "London and Westminster Bank."

GUIDE TO THE PURCHASE OF ARTIFICIAL MANURES AND FEEDING STUFFS.

FEEDING CAKES.

1. *Linseed-cake* should be purchased as "Pure," and the insertion of this word on the invoice should be insisted upon. The use of such words as "Best," "Genuine," &c., should be objected to by the purchaser.

2. *Rape-cake for feeding purposes* should be guaranteed "Pure," and purchased by sample.

3. *Decorticated Cotton-cake* should be guaranteed "Pure," and purchased by sample.

4. *Undecorticated Cotton-cake* should be guaranteed "Pure," and purchased by sample.

N.B.—All feeding cakes should be purchased in good condition, and the guarantee of the vendor should be immediately checked by a fair sample (taken out of the middle of the cake) being at once sent for examination to a competent analytical chemist. The remainder of the cake from which the sample sent for examination had been taken should be sealed up in the presence of a witness, and retained by the purchaser for reference in case of dispute.

ARTIFICIAL MANURES.

1. *Raw or Green Bones or Bone-dust* should be purchased as "Pure" Raw Bones guaranteed to contain from 45 to 48 per cent. of tribasic phosphate of lime, and to yield not less than 4 per cent. of ammonia.

2. *Boiled Bones* should be purchased as "Pure" Boiled Bones guaranteed to contain from 55 to 60 per cent. of tribasic phosphate of lime, and to yield not less than 1 per cent. of ammonia.

3. *Dissolved Bones* are made of various qualities, and are sold at various prices per ton; therefore the quality should be guaranteed under the heads of *soluble* phosphate of lime, *insoluble* phosphate of lime, and nitrogen, or its equivalent as ammonia. The purchaser should also stipulate for an allowance for each unit per cent. which the dissolved bones should be found on analysis to contain less than the guaranteed percentages of the three substances already mentioned.

4. *Mineral Superphosphates* should be guaranteed to be delivered in a sufficiently dry and powdery condition, and to contain a certain percentage of *soluble* phosphate of lime, at a certain price per unit per cent., no value to be attached to *insoluble* phosphates.

5. *Compound Artificial Manures* should be purchased in the same manner and with the same guarantees as Dissolved Bones.

6. *Nitrate of Soda* should be guaranteed by the vendor to contain 95 per cent. of pure nitrate.

7. *Sulphate of Ammonia* should be guaranteed by the vendor to contain not less than 24 per cent. of ammonia.

8. *Peruvian Guano* should be sold under that name, and guaranteed to be in a dry and friable condition, and to contain a certain percentage of ammonia.

N.B.—Artificial manures should be guaranteed to be delivered in a sufficiently dry and powdery condition to admit of distribution by the drill. A sample for analysis should be taken, not later than three days after delivery, by emptying several bags, mixing the contents together, and filling two tins holding about half a pound each, in the presence of a witness. Both the tins should be sealed, one kept by the purchaser for reference in case of dispute, and the other forwarded to a competent analytical chemist for examination.

INSTRUCTIONS FOR SELECTING AND SENDING SAMPLES FOR ANALYSIS.

ARTIFICIAL MANURES.—Take a large handful of the manure from three or four bags, mix the whole on a large sheet of paper, breaking down with the hand any lumps present, and fold up in tinfoil, or in oil-silk, about 3 oz. of the well-mixed sample, and send it to 12 HANOVER SQUARE, W., by post; or place the mixed manure in a small wooden or tin box, which may be tied by string, but must not be sealed, and send it by post. If the manure be very wet and lumpy, a large boxful, weighing from 10 to 12 oz., should be sent either by post or railway.

Samples weighing less than $\frac{1}{2}$ lb. should be sent by letter post; samples above that weight can be most cheaply forwarded by parcel post.

The parcels should be addressed: DR. J. AUGUSTUS VOELCKER, 12 HANOVER SQUARE, LONDON, W., and the address of the sender or the number or mark of the article should be stated on the parcels.

The samples may be sent in covers, or in boxes, bags of linen or other materials.

SOILS.—Have a wooden box made 6 inches long and wide, and from 9 to 12 inches deep, according to the depth of soil and subsoil of the field. Mark out in the field a space of about 12 inches square; dig round in a slanting direction a trench, so as to leave undisturbed a block of soil with its subsoil 9 to 12 inches deep; trim this block to make it fit into the wooden box, invert the open box over it, press down firmly, then pass a spade under the box and lift it up, gently turn over the box, nail on the lid, and send it by goods or parcel train to the Laboratory. The soil will then be received in the exact position in which it is found in the field.

In the case of very light, sandy, and porous soils, the wooden box may be at once inverted over the soil and forced down by pressure, and then dug out.

WATERS.—The water, if possible, should be sent in a glass-stoppered Winchester half-gallon bottle, which is readily obtained at any chemist or druggist's shop. If Winchester bottles cannot be procured, the water may be sent in perfectly clean new stoneware spirit-jars, surrounded by wickerwork. For the determination of the degree of hardness before and after boiling, only one quart wine-bottle full of water is required.

LIMESTONES, MARLS, IRONSTONES, AND OTHER MINERALS.—Whole pieces, weighing from 3 to 4 oz., should be sent enclosed in small linen bags, or wrapped in paper. Postage 2d., if under 4 oz.

OILCAKES.—Take a sample from the middle of the cake. To this end break a whole cake into two. Then break off a piece from the end where the two halves were joined together, and wrap it in paper, and send by parcel post. The piece should weigh at least from 10 to 12 oz. If sent by railway, one quarter or half a cake should be forwarded, carriage prepaid.

FEEDING MEALS.—About 3 oz. will be sufficient for analysis. Enclose the meal in a small linen bag. Send it by post.

On forwarding samples, separate letters should be sent to the Laboratory specifying the nature of the information required, and, if possible, the object in view.

Members' Veterinary Privileges.

I.—ADMISSION OF SICK OR DISEASED ANIMALS TO THE ROYAL VETERINARY COLLEGE.

1. Members of the Society have all the privileges of subscribers to the Royal Veterinary College, Camden Town, N.W., so far as the admission for treatment of Cattle, Sheep, and Swine is concerned, without being called upon to pay the annual subscription to the College of two guineas. The charges made by the College for keep and treatment are as follows:—Cattle, 10s. 6d., and Sheep and Pigs, 8s. 6d. per week for each animal.

2. The full privileges of subscribers, including the examination of horses, and the admission of horses and dogs into the College Infirmary for surgical or medical treatment, on payment of the cost of keep, will be accorded to members of the Society on payment of a subscription to the College of one guinea instead of two guineas per annum.

II.—FEES FOR CONSULTATIONS, ANALYSES, AND EXAMINATIONS AT THE ROYAL VETERINARY COLLEGE.

The following fees are payable by Members of the Society for services performed at the Royal Veterinary College on their behalf in cases where a visit to the locality is not involved:—

	£	s.	d.
Personal consultation with a Veterinary Professor	0	10	6
Consultation by letter	0	10	6
Post-mortem examination of an animal, and report thereon	1	1	0
Chemical Examination of viscera for metallic poison	1	0	0
Chemical Examination of viscera complete, for metals and alkaloids	3	0	0

III.—INVESTIGATION OF OUTBREAKS OF DISEASE AMONG FARM STOCK.

1. In the event of an outbreak of disease among Cattle, Sheep, or Swine occurring on the farm of any Member of the Society, application should at once be made to the Principal of the Royal Veterinary College, Great College Street, London, N.W.

2. The Principal will then instruct an officer of the College, or one of the Society's Provincial Veterinary Surgeons, to inquire into the outbreak and to report to him. He will also fix the amount of remuneration to be paid to the Inspector, whose professional fee will in no case exceed two guineas per day, exclusive of the actual cost of travelling and maintenance.

3. When it appears on the report of the Inspector selected that the outbreak was of an important character, or of general interest, the cost of the investigation will be defrayed by the Royal Veterinary College.

4. An annual grant is made by the Society to the Royal Veterinary College in aid of the further development of Cattle Pathology. In order to assist the authorities of the College in making the necessary investigations, Members of the Society are particularly requested to send to the College any diseased animals (cattle, sheep, or swine) which they would otherwise destroy as useless, and also any specimens of diseased parts of an unusual character. In the event of living animals being sent, it will be necessary to telegraph to the College at Camden Town the time of their arrival at a London station, so that a van may be sent to meet them. The expense of transit will be defrayed by the Royal Veterinary College.

IV.—PROVINCIAL VETERINARY SURGEONS.

Members of the Society who may require veterinary assistance or advice in any case of disease are recommended to apply to the nearest Provincial Veterinary Surgeon in the district, as given in the subjoined list; but in such cases the member must arrange with the Veterinary Surgeon as to payment of fees.

County.	Provincial Veterinary Surgeon.
Anglesey	Hugh Jones, Brynarron, Langefni.
Bedford	Henry Crofts, Harper Street, Bedford.
Berks	Henry Allnut, Thames Street, Windsor.
Brecon	John Price, Brecon.
Bucks	G. A. Lepper, Aylesbury.
Cambridge	G. A. Banham, Downing Street, Cambridge.
Cardigan	J. Dawson Roberts Aberystwith.

County.	Provincial Veterinary Surgeon.
Carnarvon	F. Booth, Market Street, Abergale.
Chester	W. Lewis, 1 South Street, Nantwich Road, Crewe.
Cornwall	Thos. Oliver, Truro.
Cumberland	John Bell, Lonsdale Street, Carlisle.
Denbigh	F. Booth, Market Street, Abergale.
Derby	W. Anlton, Derwent Street, Derby.
Devon	W. Penhale, Barnstaple.
Dorset	W. Vessey, Weymouth.
Durham	John E. Peele, 8 New Elvet, Durham.
Essex	James Taylor, Vengewell Hall, Wix, Manningtree.
Flint	Robert Roberts, 30 Bridge Street, Wrexham.
Glamorgan	Charles Moir, Cardiff.
Gloucester	Professor W. T. Wilson, Royal Agricultural College, Cirencester.
Hants	J. D. Barford, 57 Above Bar, Southampton.
Hereford	W. Good, 30 Mill Street, Ludlow.
Herts	W. Wilson, Berkhamstead.
Hunts	James Smith, Huntingdon.
Kent	W. A. Edgar, Westfield House, Dartford.
Lancaster	J. B. Fording, Red Lion Street, Burnley.
Leicester	John Wiggins, Market Harboro'.
Lincoln (South)	Captain B. H. Russell, Grantham.
Lincoln (Mid)	Charles Hartley, 4 Norman Place, Lincoln.
Lincoln (North)	J. B. Greswell, Mercer Row, Louth.
Merioneth	Evan Wynne Williams, 1 Queen's Row, Dolgelly.
Metropolis and Middlesex	William Hunting, 16 Fulham Road, S.W.
Monmouth	G. Lewis, Monmouth.
Montgomery	James Mc'Cavin, Montgomery.
Norfolk	Frederick Low, Norwich.
Northampton	T. J. Merrick, Castilian Street, Northampton.
Northumberland and Westmorland	C. Stephenson, Sandycroft Villa, Newcastle-on-Tyne.
Notts	Frank H. Gibbins, Albert Sq., Derby Road, Nottingham.
Oxford (North)	Chas. N. Page, Banbury.
Oxford (South)	J. P. S. Walker, Oxford.
Pembroke	David Evans, Haverfordwest.
Bedford	B. Freer, Uppingham.
Salop	W. E. Litt, Shrewsbury.
Somerset (North)	T. D. Broad, Broad Street, Bath.
Somerset (South)	Robert Gibbs, Taunton.
Stafford	Harry Oliver, Trescoe, Tamworth.
Suffolk	J. Worsley, Ipswich.
Surrey	J. L. Lupton, Richmond.
Sussex (East)	R. A. Stock, Lewes.
Sussex (West)	I. H. Callow, Horsham.
Warwick	Osborn Hills, Leamington.
Wilt	H. Hussey, Devizes.
Worcester	H. R. Perrins, Upper Butts, Worcester.
York (East Riding)	James Jebson, Yapham Grange, Pocklington.
York (North Riding)	W. Barker, Middlesborough.
York (West Riding)	Joseph Carter, 28 Great Horton Road, Bradford.

Members' Entomological Privileges.

The Council have fixed the charge of 2s. 6d. for the determination of the species of any insect, worm, or other animal which, in any stage of its life, injuriously affects farm-crops, with a report on its habits, and suggestions as to the methods of prevention and remedy.

Portions of the plants injured should accompany the specimens of the insects.

All specimens should be sent in tin or wooden boxes, or in quills, so as to prevent injury in transmission.

Parcels or letters containing specimens (carriage or postage paid) must be addressed to Miss E. A. ORMEROD, F.R.Met.Soc., Torrington House, Holywell Hill, St. Albans.

Members' Botanical Privileges.

The Council have fixed the following rates of charge for the examination, by the Society's Consulting Botanist, of Plants and Seeds, for the *bonâ fide* and individual information and benefit of Members of the Society (not being seedsmen).

The charge for examination must be paid at the time of application, and the carriage of all parcels must be prepaid.

- 1.—A report on the purity, amount, and nature of foreign materials, the perfectness and germinating power of a sample of seed 1s.
- 2.—Determination of the species of any weed or other plant, or of any epiphyte or vegetable parasite, with a report on its habits, and the means for its extermination or prevention 1s.
- 3.—Report on any disease affecting farm crops 1s.
- 4.—Determination of the species of a collection of natural grasses found in any district, with a report on their habits and pasture value 5s.

N.B.—The Consulting Botanist's Reports on Seeds are furnished to enable Members,—purchasers of seeds and corn for agricultural or horticultural purposes,—to test the value of what they buy, and are not to be used or made available for advertising or trade purposes.

PURCHASE OF SEEDS.

The purchaser should obtain from the vendor, by invoice or otherwise, a proper designation of the seed he buys, with a guarantee that it contains not more than a specified amount of other seeds, and is free from ergot, or, in the case of clovers, from dodder, and of the percentage of seeds that will germinate.

The germination of cereals, green crops, clovers, and timothy grass should be not less than 90 per cent.; of foxtail, not less than 60 per cent.; of other grasses, not less than 70 per cent.

The Council strongly recommend that the purchase of prepared mixtures should be avoided, and that the different seeds to be sown should be purchased separately.

INSTRUCTIONS FOR SELECTING AND SENDING SAMPLES.

I. SEEDS.

In sending seed or corn for examination the utmost care must be taken to secure a fair and honest sample. In the case of grass-seeds, the sample should be drawn from the centre of the sack or bag, and in all cases from the bulk delivered to the purchaser and not from the purchased sample. When bought by sample the whole or part of that sample should be sent.

When it is considered necessary to secure legal evidence, the sample should be taken from the bulk and placed in a sealed bag in the presence of a reliable witness who is acquainted with the identity of the bulk, and care should be taken that the purchased sample and bulk be not tampered with after delivery, or mixed or come in contact with any other sample or stock.

One ounce of grass and other small seeds should be sent, and two ounces of cereals or larger seeds. The exact name under which each sample has been bought should be sent with it.

Grass-seeds should be sent at least FOUR WEEKS, and clover-seeds TWO WEEKS before they are required, and they should not be sown until the report has been received.

II. PLANTS.

In collecting specimens of plants, the whole plant should be taken up, and the earth shaken from the roots. If possible, the plants must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. They should be placed in a bottle, or packed in tinfoil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

Parcels or letters containing seeds or plants for examination (carriage or postage prepaid) must be addressed to Mr. W. CARRUTHERS, F.R.S., 44 Central Hill, Norwood, London, S.E.

MEMORANDA.

ADDRESS OF LETTERS.—All letters on the general business of the Society should be addressed to the Secretary, at 12 Hanover Square, London, W.

TELEGRAMS.—The Society's registered address for telegrams is "Practice, London." *Replies by Telegraph cannot be sent unless paid for in advance, and cannot be guaranteed in any case.*

TELEPHONE NUMBER, 3675.

OFFICE HOURS.—10 to 4. On Saturdays 10 to 2.

GENERAL MEETING in London, Thursday, May 22, 1890, at noon.

COUNTRY MEETING at Plymouth, Monday, June 23, to Friday, June 27, 1890 (both inclusive).

MONTHLY COUNCIL (for transaction of business), at noon on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

ADJOURNMENTS.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

SUBSCRIPTIONS.—1. *Annual.*—The subscription of a Governor is £5, and that of a Member £1, due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June.

2. *For life.*—Governors may compound for their subscriptions for future years by paying on election, or at any time thereafter, the sum of £50, and Members by paying £15. Members elected before 1890 may compound at any time on payment of £10 in one sum; and Members elected in or subsequently to 1890 may compound for the same amount after the payment of ten annual subscriptions. Governors and Members who have paid their annual subscription for 30 years or upwards, and whose payments are not in arrear, may compound for future annual subscriptions, that of the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member. No Governor or Member can be allowed to enter into composition for life until all subscriptions due by him at the time shall have been paid.

No Governor or Member in arrear of his subscription is entitled to any of the privileges of the Society.

All Members belonging to the Society are, under the Bye-laws, bound to pay their annual subscriptions, until they shall withdraw from it by notice in writing to the Secretary.

PAYMENTS.—Subscriptions may be paid to the Secretary, either at the office of the Society, No. 12 Hanover Square, London, W., or by means of crossed cheques in favour of the Secretary, or by postal orders, to be obtained at any of the principal post-offices throughout the kingdom, and made payable at the Vere Street Office, London, W. When making remittances it should be stated by whom, and on whose account, they are sent. All Cheques and Postal Orders should be crossed "London and Westminster Bank, St. James's Square Branch."

On application to the Secretary, forms may be obtained for authorising the regular payment, by the bankers of individual members, of each annual subscription as it falls due. Members are particularly invited to avail themselves of these Bankers' orders, in order to save trouble both to themselves and to the Society. When payment is made to the London and Westminster Bank, as the Bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the bankers' book may be at once identified, and the amount posted to the credit of the proper person. No coin can be remitted by post, unless the letter be registered.

JOURNAL.—The Parts of the Society's Journal are (when the subscription is not in arrear) forwarded by post to Members or delivered from the Society's Office to Members or to the bearer of their written order.

The back numbers of the Journal are kept constantly on sale by the publisher, Mr. JOHN MURRAY, 50A Albemarle Street, W.

NEW MEMBERS.—Every candidate for admission into the Society must be nominated by a Governor or Member, and must duly fill up and sign an application for Membership on the appointed form. Forms of Proposal may be obtained on application to the Secretary. The Secretary will inform new Members of their election by letter.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, APRIL 2, 1890.

LORD MORETON (PRESIDENT) IN THE CHAIR.

Present:—

Trustees.—Earl Cathcart, Sir Nigel Kingscote, K.C.B., Sir A. K. MacDonald, Bart., Mr. J. Dent Dent.

Vice-Presidents.—Earl of Feversham, Earl of Ravensworth, Sir John Thorold, Bart., Mr. C. Whitehead.

Other Members of Council.—Mr. G. M. Allender, Mr. J. Bowen-Jones, Mr. J. A. Caird, Mr. Chandos-Pole-Gell, Mr. Charles Clay, Mr. C. de L. F. De Laune, Viscount Emlyn, Mr. S. P. Foster, Mr. William Frankish, Mr. Anthony Hamond, Mr. James Hornsby, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. T. H. Miller, Hon. Cecil T. Parker, Mr. Albert Pell, Mr. Daniel Pidgeon, the Duke of Portland, Mr. J. E. Ransome, Mr. James Rawlence, Mr. Samuel Rowlandson, Mr. G. H. Sanday, Mr. A. J. Smith, Mr. Henry Smith, Sir Joseph Spearman, Bart., the Marquis of Stafford, Mr. Garrett Taylor, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. C. W. Wilson, Sir Jacob Wilson.

Professor Brown, C.B., the Mayor of Plymouth, Mr. John Clinton (Foundation Life Governor).

Officers.—Mr. Ernest Clarke, Secretary and Editor; Professor James B. Simonds, Consulting Veterinary Surgeon; Mr. E. W. Voelcker, Acting Consulting Chemist; Mr. Wilson Ben- nison, Surveyor.

The minutes of the Council held on March 5 last were read and confirmed.

Election of New Governors and Members.

The election of the following eight Governors and sixty-five members was then proceeded with:—

Governors.

CLINTON, Lord...Heanton Satchville, N. Devon.
DICKSON-FOYNDER, Sir J., Bart...Hartham Park, Cornham, Wilts.
GILSTRAP, Sir W., Bart...Fornham Park, Bury St Edmunds.
GRANT, Sir G. Macpherson, Bart...Ballindallock Castle, N.B.
HARCOURT, E. W...Nuneham Park, Abingdon.
LONDSEBOROUGH, Earl of...Londesborough Park, Market Weighton, Yorks.
SCHRODER, Baron...The Dell, Staines.
TWEEDMOUTH, Lord...Brook House, Park Lane, W.

Members.

ALEXANDER, W., jun...Les Marais, St. Mary's, Jersey.
BALDOCK, Captain E...Belvedere, East Malling.
BELDAM, F. W. E...Toft Rectory, Cambridge.
BLAMEY, J. H...Liskeard, Cornwall.
BRAWN, John...Melchbourne, Bedford.
BRIDGMAN, F. H...Kingston, Stoke Gifford, Callington, Cornwall.
BROOKE, Arthur...Leylands, near Dorking.
BURNS, T. B...Camelford, Cornwall.
CARWARDINE, Joseph...Old Parsonage House, Bedminster, Bristol.
CORDONNIER, Anatole...Roubaix, France.
CRESER, John...Manhemot, Cornwall.
CULVERWELL, W. J...Dunleigh Farm, Bridgewater.
DAMERELL, E. F...Collwell Farm, Egg Buckland, Devon.
EAST, J. T...The Limes, North End, East Ham, E.
EKKERTON, T. F...Alverley Hall, Doncaster.
FRANKLIN, T. M...St. Hilary, Cowbridge, Glamorganshire.
GAWN, C. R...Chetwynd Park, Newport, Salop.
GRANK, T. H...St. Germans Quay, Cornwall.
GOODMAN, C...Faircrofts, Barking, Essex.

GREGORY, T...Tarbock, Prescott, Lancashire.
 HAMBLY, P...Westcott, Callington, Cornwall.
 HARFORD, W. H...Oldown House, Almondsbury.
 HATHERTON, Lord...Teddlesley, Penkridge, Staffs.
 HAWKE, G...Castlewich, Callington.
 HEAMAN, G. jun...Down Farm, Dolton, Devon.
 HOFF, H...Wormegay, King's Lynn.
 HOOPFELL, W. W...Scobbiscombe, Kingston, Kingsbridge.
 IVORY, John...Wilson's, East Ham, E.
 LANGMAN, William...Upton Park, E.
 LAVERTON, Arthur...Bella Vista, Truro.
 LILLICO, William...Croydon.
 MACRAE, J...The Oaks, Woodmansterne, Epsom.
 MANCHESTER, J...St. John, New Brunswick, Canada.
 MATTHEW, Frank...Leeming Bar, Yorks.
 MEDFORTH, R...Bridlington, Yorks.
 OUTWIN, H...The Parks, Hatfield, Doncaster.
 OZANNE, H. M...Lillyvale, Castel, Guernsey.
 PAYNE-GALLWEY, A. P...Pillmoor, York.
 PHILLIPS, Seth...157 Highbury New Park, N.
 POLE-CAREW, Colonel R...Antony, Torpoint.
 PORTER, John...Ringmer, Lewes.
 RADFORD, C. H...West Acton, Yelverton.
 RAWSON, F. H...Woodhurst, Crawley.
 REED, W. H...Drumhead Iron Works, Lannecston.
 RICHARD, H...8 Old Town Street, Plymouth.
 RIDING, E. J...College of Agriculture, Downing.
 ROBINSON, E. H...The Albert Works, Preston.
 ROGERS, K. P...Burncoose, Perranarworthal.
 ROYCE, G. A...The Grove, Richmond, Yorks.
 SEATON, Lord...Nutwell Court, Lympstone, Devon.
 SERPELL, W...Gt. Kellow, Polperro, R.S.O., Cornwall.
 SIMONDS, John...Elloe House, Leyton, Essex.
 SPARKS, A. J...South Farm, Brixton, Devon.
 SPURWAY, Bryan P...Heathfield Rectory, Taunton.
 TABOR, C. A...Sutton Hall, Rochford.
 THOMPSON, W...White Cross Grange, Wadworth, Doncaster.
 THOMSON, G. M. T...25 Belgrave Crescent, Edinburgh.
 THORNTON, J...1 Park Street, Cirencester.
 TITT, J. W...Woodcock Iron Works, Warminster.
 WARNER, T. G. T...Highams, Woodford Green.
 WATKINS, J. H...Home Farm, Denham, Bucks.
 WESTON, T. W...Tollackio, Cornwall.
 WILLIAMS, A...23 Great Eastern Street, E.C.
 WILSON, H. G...48 Stanhope Gardens, W.
 WROTH, W. S...Court Barton, Bigbury, Kingsbridge.

The reports of the several Committees were then presented and adopted as below:—

Finance.

SIR NIGEL KINGSCOTE (Chairman) reported that the accounts for the month of March, as certified by the Society's accountants, showed receipts amounting to 1,506*l.* 8*s.*, and expenditure 1,375*l.* 2*s.* 7*d.* The balance at the bank on March 31, allowing for cheques outstanding, was 7,064*l.* 17*s.* 6*d.* Accounts amounting

in all to 3,439*l.* 0*s.* 17*d.* had been passed, and were recommended for payment. The quarterly statement of subscriptions, arrears, and property had been submitted and approved. The Committee recommended that the names of thirty-eight deceased members, five who have resigned, and one in arrear, be struck off the Society's books; and suggested that a conference of the officials of the Plymouth Meeting be convened by the President for Tuesday, May 6, to settle details connected with the management of the Show.

SIR NIGEL KINGSCOTE added that the Finance Committee would be greatly obliged if members of Council and of the Society generally would acquaint the Secretary with the death of any members in their respective districts, as it was otherwise exceedingly difficult to obtain accurate information of the deaths, changes of addresses, &c., of members, especially of life members.

House.

SIR NIGEL KINGSCOTE (Chairman) presented the recommendations of the Committee as to the erection of a further book-case and various house repairs.

Journal.

EARL CATHCART (Chairman) reported that the first number of the new quarterly Journal was now published, and copies would be issued to members immediately. The question of the free list for the Journal had been again discussed, and directions given to the Editor thereon. The articles to appear in future numbers of the Journal had been preliminarily settled.

Chemical.

VISCOUNT EMLYN (Chairman) reported that the proposed form of contract note for cakes [see page 192] had been again considered, and instructions given for copies to be sent out to members with the current number of the Journal. The Committee called special attention to a compound called Phosphate Fish Bone Guano, which was being sold at the price of 3*l.* 10*s.* per ton delivered free. Three samples of this so-called manure had been forwarded by members of the

Society, and had been analysed, with the following results:—

	No. 1.	No. 2.	No. 3.
Moisture	8.43	.94	2.95
*Organic matter . . .	20.27	2.23	6.35
Phosphate of lime . .	5.18	.85	1.53
Oxide of iron, alkalis, } magnesia, &c.	13.08	3.30	3.32
Sand	59.04	92.58	85.85
	100.00	100.00	100.00
*Containing nitrogen	1.47	.29	.68
Equal to ammonia	1.78	.35	.78

At the Woburn Sub-Committee, letters had been read from the Board of Agriculture with reference to the experiments with *Lathyrus sylvestris* carried out last year at Woburn, and the Secretary had been instructed to inform the Board that it was proposed to continue these experiments. As to the request of the Board that the Society should nominate two or three gentlemen likely to conduct experiments on different soils, the Committee thought it desirable that no steps should be taken with regard to this until the experiments should be further developed.

The Sub-Committee recommended that for the present year the usual excursion to Woburn be discontinued, but that special arrangements be made for any gentlemen wishing to visit the experiments. The experiments on sheep-feeding would shortly be concluded, and arrangements made for the sale and slaughter of the sheep.

Seeds and Plant Diseases.

Mr. WHITEHEAD (Chairman) stated that Miss Ormerod had reported that experiments would be made in the coming season in various fruit-producing districts, with remedies against the attack of the winter moth caterpillars. A letter having been received from Mr. Robert Garton asking that the Society would undertake the supervision of his experiments for the improvement of cereals, the Committee recommended that the application be not complied with.

Veterinary.

Sir JOHN THOROLD (Chairman) stated that Professor Brown had presented the quarterly report of the Royal Veterinary College (see page 413), which was ordered to be published.

The Worshipful Company of Farriers had accepted (subject to one or two verbal changes) the provisions of the scheme for the examination and registration of farriers, as amended by the joint conference, and the Royal College of Veterinary Surgeons had accepted the scheme except as regarded the phrase "Farriers as Shoeing-smiths," which they proposed should read "Farriers or Shoeing-smiths." This alteration having been accepted by the Worshipful Company, the Committee recommended that it also receive the sanction of the Society.

Professor Brown had presented his monthly report as follows:—

PLEURO-PNEUMONIA.—In Great Britain, in the four weeks ending March 22, there were twenty-four fresh outbreaks of this disease, sixteen in England, in the counties of Cumberland, Hants, Kent, Lancaster, London, and Stafford; the eight outbreaks in Scotland occurred in Edinburgh and Perth. The number of cattle attacked was 150, viz. 100 in England and fifty in Scotland; while the number of healthy cattle slaughtered in contact was 260 in England and 237 in Scotland. In Ireland there were four fresh outbreaks of pleuro-pneumonia in the four weeks, all of them in the North and South Dublin Unions; thirty-eight cattle were attacked, and 146 healthy ones in contact were slaughtered.

ANTHRAX.—There were five outbreaks of this disease reported in England—in Lincoln (Kesteven), Sussex (west), York (East and West Riding). In Scotland, three outbreaks of anthrax occurred in Banff, Dumbarton, and Lanark. Altogether eighteen animals were attacked, eleven of which died. In Ireland there were two outbreaks of anthrax, and six animals attacked, three of which died, and three recovered.

SWINE FEVER.—In Great Britain there were 225 fresh outbreaks of swine fever, and 1,804 pigs attacked; 673 diseased swine were killed, 516 died, 131 recovered, and 208 remained alive at the end of the week. In Ireland sixteen outbreaks occurred, and forty-three pigs were attacked.

* See also page 418.

RABIES.— In England, eight cases of this disease were reported, all of them in dogs, in the counties of Hants, London, Middlesex, Notts, Sussex (west), and York (West Riding). In Ireland seven cases of rabies were reported in dogs in the counties of Carlow, Cork, Galway, Leitrim, Limerick, and Londonderry.

Sir JOHN THOROLD added that in order to properly start the scheme for the registration of Farriers, some financial assistance on the part of the Society would no doubt be necessary, and he gave notice, therefore, that at the next meeting of the Council he would move for a grant for this purpose.

Importation of American Store Cattle.

Sir JACOB WILSON then rose and said: For some time past there has been a movement in Scotland and elsewhere to secure the importation of store cattle from the United States to be landed in this country without being subject to slaughter, and no doubt many members of the Council, like myself, have received letters advancing those views. More recently these opinions have found expression in two questions which have been put to the President of the Board of Agriculture in the House of Commons. It seems, therefore, absolutely necessary that the whole question should be very carefully considered. More especially is this the case at the present moment, when, in conformity with the expressed opinions of this Society and the representatives of agriculturists all over the kingdom, the Government are about to take stringent measures for the eradication of pleuro-pneumonia. It certainly seems a most ill-advised act to do anything which might tend to nullify the proposed action of the Government by exposing ourselves to the risk of introducing disease from abroad through a new channel. I cannot but think that if this Society were to assent to any such proposal, or were to abstain from entering a most decided protest against it, we should justly lay ourselves open to the charge of inconsistency by shutting the door from disease and opening another.

It is of course well known, and the advocates of the importation of American stores have admitted it, that the Eastern States of America are so tainted with pleuro-pneumonia that importation from them cannot possibly be contemplated. This view is emphasised by the fact that two cargoes during the last week have been landed from America in which pleuro-pneumonia was found to exist. When, however, they change their ground and ask for the importation of cattle from the Western States, they are confronted by two difficulties, to my mind insuperable, for which they have never offered any solution. Firstly, they have not indicated any means by which the English Government can satisfy itself according to the Act as to which portions of the United States are free from pleuro-pneumonia, nor have they indicated in what way any precautions could be taken against the introduction of pleuro-pneumonia from infected States into those which may at the present moment be practically healthy. Secondly, they have not, so far as I know, indicated any means by which animals from the Western States, assuming they are free from disease, can be safely brought through the tainted districts in the East and shipped from the Atlantic ports. Even if animals could be safely transported across the Continent in "bond," it appears to me that it would be exceedingly difficult to prevent their communication at the port of lading with animals from the diseased districts.

I think it may be taken for granted that the difficulties attendant upon the importation of store cattle from the Western States of America through the Atlantic ports are so great, that it may, for the present at least, be dismissed from the region of practical politics. But there is another aspect of the question which is more specious in appearance, though to my mind more dangerous in its possible results. It has been suggested that animals might be brought into this country through the Southern States of America, more especially from Texas, which are very far distant from the regions affected with pleuro-pneumonia, and the cattle from which might be shipped to ports.

upon the Gulf of Florida, such as Galveston, thus obviating any risk of coming into contact with pleuro-pneumonia. This proposal is specious, because at the present moment, so far as we know, Texas and the neighbouring States are free from pleuro-pneumonia; but I would point out that were animals allowed to come from Galveston, the result would inevitably be a considerable movement of stores from other districts to that favoured port, which might soon deprive Texas of its immunity from pleuro-pneumonia. This danger is one which must necessarily always exist, because, as is well known, the American Constitution does not admit of any State restrictions imposed by the Federal Government; and it is always more than probable that there would not be that uniformity of action between the States concerned which would be our only safeguard against the introduction of disease. Moreover, there is the further danger to be considered, of the risk of introducing the Texan fever into this country. Any one who has travelled in America must be aware what a terrible scourge that disease has been to the district where it has appeared, and I for one, and I am certain my colleagues on the Council as well, could not for a moment consent to any legislation which might lay this country open to its introduction.

Passing from the question of disease upon the other side of the Atlantic, whence arises this inordinate demand upon this side for store stock? There are to my mind two prominent points connected with it. First of all, it is to a great extent local in its character: There is, of course, a general scarcity of stores throughout the country, but it is only in certain corn-growing districts where the demand has reached its present acute stage. Secondly, I believe it is of a temporary nature. If we examine into the causes of the present scarcity of stores, I think it will be found to a very considerable extent to lie in the ravages which have been caused in recent years by cattle disease, and to the consequent discouragement which has been given to breeding. We are now happily free from foot-and-mouth disease, and

I trust that the legislation now proposed may result in ridding us of pleuro-pneumonia. I am strongly of opinion that it will be better, even with some inconvenience, to await that result, than to endeavour to fill the gaps which have been caused by disease in our herds by exposing ourselves to the risk of other disease by admitting animals from the United States.

For my own part, I do not believe that this demand for the importation of American stores is of a purely spontaneous or disinterested character. It is, on the one hand, urged by the Americans themselves, and it is upon this side of the water mainly advocated by gentlemen who, however great their stake may be in this country, have considerable interests in the United States, which very naturally cause them to be anxious, if possible, to open up an export trade from that country to this. But, natural as this action is on the part of owners of American ranches, I am not myself prepared, nor do I believe that the agriculturists of this country are prepared, to run the risks which we are asked to do at the bidding of these gentlemen or for the promotion of the interests of the United States. I earnestly trust that this Society and other agricultural bodies throughout the country may make clearly known to Her Majesty's Government the feelings of agriculturists generally upon this point, and may urge upon them the extreme danger of listening to proposals of this nature. I beg, therefore, to move the following resolution:—

1. That this Council has observed with alarm the renewal of proposals for the admission into this country of cattle from the United States without being subject to slaughter, and, in view of the serious risk which would thus be incurred of introducing disease, desires to enter an emphatic protest against any present relaxation of the existing regulations.

2. That a copy of this resolution be forwarded to the Board of Agriculture.

The Earl of FEVERSHAM seconded the resolution, saying that, after

the exhaustive speech of their friend Sir Jacob Wilson, he felt that very few words would be necessary from him. He cordially agreed with all that had been stated as to the danger of admitting store cattle from America, as was proposed. They had only to look at the report of the Veterinary Committee that day, and what did they find? One hundred and fifty cattle had been suffering from pleuro-pneumonia during the last four weeks, and had been slaughtered. Of healthy cattle in Great Britain there had been no less than 500 slaughtered. That was a very serious state of affairs, and he could not help thinking that the proposal against which they asked the Council to protest and object was one which would probably materially contribute to aggravate the state in which they found some of the herds in this country. The agricultural interest in the country had made great sacrifices to avert the introduction of this disease from foreign countries. They could not do better than leave the matter in the hands of the Government, who had brought forward the bill to which Sir Jacob had alluded, and which had been carried last night in the House of Commons without a division. He thought this proposal was likely to strengthen their hands, and he had great pleasure in seconding the motion, feeling it would be both dangerous and impolitic to admit cattle from those parts of America to which reference had been made.

The resolution was then put, and carried unanimously, and a copy ordered to be forwarded to the Board of Agriculture.

The Earl of RAVENSWORTH drew attention to the importance of including in Professor Brown's monthly report the date of each occurrence of anthrax, stating that people were apt to say that such occurrence had happened a long time ago. If the date were inserted it would draw the attention of neighbouring counties to the outbreak, and to the necessity of taking the greatest possible precautions at once, in order to prevent the spread of so fearful a disease as anthrax.

Professor Brown having stated

that there would be no difficulty in supplying the dates of each outbreak of anthrax, his Lordship formally moved, Sir JOHN THOROLD seconded, and it was resolved that the dates be given in future in the monthly reports.

Stock Prizes.

Mr. SANDAY (Chairman) stated that the Committee had considered various points arising out of the prize sheet, and proposed to hold a special meeting on May 6 to discuss the whole question of the composition of the Society's prize sheet and regulations.

Judges' Selection.

Mr. SANDAY (Chairman) reported that the list of nominations for Judges of stock at Plymouth was now complete.

Implement.

Mr. FRANKISH (Chairman) reported that the draft regulations for the trials of threshing machines at Doncaster had been discussed and settled, and the Committee recommended their adoption as follows, and also that the entries close on Friday, August 1, 1890, in order that preparations might be made for the supply of the necessary corn:—

Doncaster Meeting, 1891: Prizes for Threshing Machines.

In connection with the Doncaster Meeting, a First Prize of 100*l.*, a Second Prize of 50*l.*, and a Third Prize of 25*l.*, are offered for the best combined portable threshing and finishing machine, to be worked by steam, and adapted to the preparation of corn for market. (The width not to exceed 4 feet 8 inches inside the frame, and the width of drum not to exceed 4 feet 6 inches).

REGULATIONS.

1. The necessary arrangements for the supply of corn (wheat, barley and oats) for the trials will be made by the Society.

2. All machines for competition must be delivered at the depot of the trial-shed not less than ten days previous to the opening of the Show.

3. The threshing machines will be driven by a portable engine through a registering dynamometer,

both provided by the Society. The driving pulleys on the machines must be adapted to 1,884 feet per minute speed of driving belt.

4. Before starting work the competitor must declare the number of attendants required. If he personally, or any other extra attendant not included in such declaration, shall render any actual assistance in working or adjusting the machine during the trial, the fact will be noted by the Judges. Each machine will be allowed fifty sheaves of wheat and fifty sheaves of barley for adjustment before the trial.

5. The order in which the several machines will be tested will be determined by the Stewards, who will decide by lot.

6. No competitor will be allowed to enter more than one machine for competition.

7. The points representing perfection will be as under:—

Clean threshing	30
Clean shaking	10
Cavings free from corn	5
Chaff free from corn	6
Chaff free from cavings, seeds and dirt	5
*Straw unbroken	5
Corn uninjured	15
Cleanliness of delivery from machines	2
(<i>i.e.</i> absence of lodgment).	
*Perfection of finishing	5
(<i>i.e.</i> screening or sorting).	
Construction and convenience of working	8
Power in proportion to results	5
Economy of Attendance	4
Price	2
Total	100

* In threshing the barley and oats, the points of straw unbroken will not be given, but will be added to the points allowed for perfection of finishing, making the number 10.

8. The sheaves to be threshed will be kept under cover. The stacks will be worked so as to give each machine as nearly as possible the same quality of work. The sheaves will be served out by weight to each machine. The straw resulting will be re-threshed, and the various products delivered by the machines, as well as the corn separated by the second threshing, will be carefully weighed and samples set apart for final comparison.

9. Means must be provided for examining the inside of the ma-

chines as perfectly as possible, in order to ascertain how completely the various products are delivered.

10. Those machines which appear to the Judges of sufficient merit, after preliminary trials with both wheat and barley, will be run for a final trial, of not less than one hour with wheat, one hour with barley, and half an hour with oats, in order to enable a more correct and satisfactory judgment of their merits to be arrived at.

11. For the exhibition of articles competing for the prizes for threshing machines, a sufficient amount of space will have to be taken by exhibitors under the ordinary regulations (to be issued later).

12. Notice of the place and date of the trials will be posted to every competitor as soon as they are fixed.¹

General Plymouth.

The Earl of FEVERSHAM reported that Sir Massey Lopes—who was unfortunately absent on account of domestic bereavement—had obtained the consent of the Bishop of Exeter to preach the sermon in the showyard on June 22. On the representation of the Mayor that Wednesday was the customary half-holiday at Plymouth, and that the appointment of any other day for a public holiday would be inconvenient, the Committee resolved that the charge for admission on that day should be one shilling, instead of half-a-crown as usual, and that the charge for both the grand stand and the stand at the dairy on that day should be one shilling. Arrangements had been made for the attendance of a detachment of the A Division of the Metropolitan Police at the Plymouth Meeting. The Committee had considered and approved the provisional programme, and left the final details for settlement by the Honorary Director and the Secretary.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the entrances and general offices at the Plymouth Show-

¹ See also page lxxix for a further regulation added by the Council on May 17.

yard had been erected, and 4,000 feet of implement shedding built; that the grand stand, dairy, and some refreshment sheds were in hand; and that the Local Committee were pulling down the wall fences inside the show-ground, and had made arrangements to lay the water services. A letter had been read from Sir W. Gilstrap as to luncheon accommodation for Governors in the Showyard, and the Committee recommended that the same privileges in this respect be accorded to Governors as to Members of Council.

The Committee recommended the acceptance of the following offers to provide appliances at the Plymouth Showyard free of charge: Messrs. Page, Keen, & Page, a clock for the turret at the entrance to the Showyard; Messrs. John Bellamy & Co., water tanks; Messrs. W. & T. Avery, a large weighbridge; Mr. J. S. Inman, the building of the bandstand.

Selection.

The recommendations of this Committee as to the vacancies on the Council having been read,

Earl CATHCART moved, Mr. SANDAY seconded, and it was unanimously resolved, that Mr. Jos. P. Terry, of Berry Field, Aylesbury, nominated at the last meeting, be elected a Member of Council, to fill the vacancy caused by the death of Mr. Herbert J. Little.

Earl CATHCART said that, as the Council would be aware, a list of retiring Members of Council, with their attendances at the Committee and Council meetings, had to be prepared at that meeting in anticipation of the general meeting on May 22. Under bye-law 23 (b), Members who did not attend meetings of the Council at least twice in each year were disqualified from being re-elected, but the Council reserved to themselves the right of waiving that provision in favour of any one if they saw just cause to do so. There were two retiring Members of Council who had not attended the prescribed number of times during the last two years (the Earl of Jersey and Mr. Sheraton), and it was the opinion of himself and of his colleagues on the Selection Committee, that this bye-law should be waived in favour of Lord Jersey.

His lordship had been in India, and since his return, as all in that room knew, had been very much indisposed. Lord Jersey had expressed a wish that no bye-law should be stretched in his behalf, but said that if the Council were disposed to apply the saving clause in his favour, he would be anxious to attend and do all that he could for the Society. Lord Jersey was a very valuable member of the Council, and therefore the Committee hoped that in his case the bye-law might be waived.

A formal motion to this effect having been unanimously passed, Earl CATHCART said that there would thus be two vacancies to fill up at the general meeting, one caused by the election of Mr. Chaplin as a vice-president, and the other by the retirement of Mr. Sheraton.

Education.

Mr. DART (Chairman) reported that Mr. Foster had been added to the Committee to fill the vacancy caused by the death of Mr. Little. Copies of the new Education Code, and of a bill introduced by Mr. Jesse Collings and others for "industrial agricultural education in public elementary schools," had been laid upon the table. A total of seventeen candidates had entered for the senior examination to take place next month, and the time table for the examination had been settled.

Dairy.

The Hon. ORCHARD T. PARKER (Chairman) reported that various details as to the Dairy and Produce Departments of the Plymouth Show had been discussed and settled. The show of old cheese in past years not having proved thoroughly satisfactory, the Committee did not suggest the offer of prizes for cheeses made in 1890 in connection with the country meeting at Doncaster in 1891.

Hunter Stallion.

Mr. BOWEN-JONES reported that the District Committees for the services of the Society's three stallions were now fully constituted, and that all the arrangements were complete. It was agreed to adjourn until the

June Council, unless occasion for summoning the Committee should arise before the end of April. Mr. Sanday had undertaken to settle with the Royal Commission on horse-breeding the proportion of the joint expenses at the Show payable by this Society.

Retiring Members of Council.

The annexed list was prepared of the Members of Council who retire by rotation, but are eligible for re-election, showing the number of attendances at Council and Committee Meetings of each of such Members during the past two years, in accordance with Bye-law No. 23.

Agricultural Congress at Vienna.

The SECRETARY read a letter from the Commercial Department of the Imperial and Royal Austro-Hungarian Embassy in London, inviting the Society's participation in an International Agricultural and Forestry Congress to be held next September in connection with the Vienna International Exhibition, and enclosing a programme of the subjects to be considered.

After some discussion, it was resolved, upon the motion of the Earl of FEVERSHAM, seconded by Mr. CHANDOS-POLK-GELL, that the Society be officially represented at this Congress by the Secretary, if his engagements at the time permit, and also by any Member of the Council who may desire to attend.

Country Meeting of 1891.

On the motion of Sir JACOB WILSON, seconded by Mr. SANDAY, the seal of the Society was authorised to be affixed, with the formalities

Attendances at Meetings of Council and Committees from April 1888 to March 1890 inclusive	Council Meetings. Total number, 19	Committees	
		No. of Meetings	Attendances
Arkwright, J. H. . . .	10	98	43
Clay, Charles	13	60	36
Emlyn, Viscount . . .	16	92	47
Foster, S. P.	11	65	25
Frankish, William . .	19	137	109
Grenville, R. Neville .	6	61	8
Hornsby, J. (elected December 19, 1888) .	10	20	11
Jersey, Earl of	2	28	1
Muntz, P. Albert, M.P. .	9	30	8
Pidgeon, Daniel (elected June 5, 1889) . . .	5	12	8
Portland, Duke of (elected April 11, 1888)	3	9	—
Ransome, James R. . .	16	36	18
Rawlence, James . . .	10	10	—
Sanday, George Henry .	18	147	128
Smith, Henry (elected March 6, 1889) . . .	8	11	5
Spearman, Sir J. L. B., Bart. (elected March 6, 1889)	7	11	4
Stafford, Marquis of . .	7	10	—
Stratton, Richard . . .	6	92	23
Sutton, Martin J. . . .	12	68	29
Tavistock, Marquis of (elected June 8, 1889) .	1	10	—
Tremayne, J. (elected March 4, 1889) . . .	7	12	1
Warren, R. A.	17	42	22
Wheeler, H. Vincent V. (elected March 6, 1889)	8	8	2

prescribed by the Charter and bye-laws, to an agreement with the Corporation of Doncaster for the holding at that town of the Society's country meeting of 1891.

Date of Next Meeting.

Other business having been transacted, the Council adjourned until Wednesday, May 7.

WEDNESDAY, MAY 7, 1890.

LORD MORETON (PRESIDENT) IN THE CHAIR.

Present:

Trustees.—General Viscount Bridport, K.C.B., Earl Cathcart, Mr. J. Dent Dent, Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., Sir M. W. Ridley, Bart., M.P.

Vice-Presidents.—Right Hon. Sir Massey Lopes, Bart., Earl of Ravensworth, Sir John Thorold, Bart., Mr. C. Whitehead.

Other Members of Council.—Mr. G. M. Allender, Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. J. Bowen-Jones, Mr. J. A. Caird, Mr. Chandos-Pole-Gell, Mr. Charles Clay, Earl of Coventry, Mr. Percy Cratchley, Mr. Alfred Darby, Mr. O. de L. F. De Laune, Viscount Eslyn, Mr. William Frankish, Mr. Hugh Gorrings, Mr. Anthony Hamond, Mr. James Hornsby, Earl of Jersey, Mr. C. S. Mainwaring, Mr. T. H. Miller, Mr. P. A. Muntz, M.P., Hon. Cecil T. Parker, Mr. Albert Pell, Mr. Daniel Pidgeon, Mr. J. E. Ransome, Mr. G. H. Sanday, Mr. W. T. Searth, Mr. A. J. Smith, Mr. Henry Smith, Sir Joseph Spearman, Bart., Mr. Richard Stratton, Mr. Garrett Taylor, Mr. Jos. P. Terry, Mr. John Tremayne, Mr. B. A. Warren, Mr. E. V. V. Wheeler, Mr. G. W. Wilson, Sir Jacob Wilson.

Professor Brown, C.B.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Professor James B. Simonds, Consulting Veterinary Surgeon; Mr. E. W. Voelcker, Acting Consulting Chemist.

The following members of the Plymouth Local Committee were also present: The Earl of Mount Edgcumbe, Mr. Edward St. Aubyn, and Mr. E. B. Johns, Secretary of the Local Committee.

Sir NIGEL KINGSCOTE said that he was requested by His Royal Highness the Prince of Wales to express his regret at being unable to attend the meeting of the Council that day, as the opening of the Military Exhibition, at

which he had promised to preside, was fixed for the same hour as the Council meeting. A letter had been received from His Royal Highness Prince Christian, who had been present at the Stock Prizes Committee on the previous day, expressing regret at the necessity of his absence owing to the same cause.

Election of Governors and Members.

The minutes of the Council held on April 2 last having been read and confirmed, the election of the following five Governors and ninety Members was proceeded with:—

Governors.

ALLENDER, G. M. Stammerham, Horsham.
ANKERST, W. A. Tysan, M.P. Didlington Hall, Brandon.
ASHBURNTON, Lord. The Grange, Alresford.
STAPILTON, Major H. M. Myton Hall, Helperby, Yorks.
SWINBURNE, Sir John, Bart., M.P. Capheaton, Newcastle-on-Tyne.

New Members.

ANDERSON, W. New House, Kenilworth.
ASH, W. H. B. The Manor Farm, Ringmore, Devon.
ASHBY, W. R. Moor Farm, Lingfield, Surrey.
AYERY, W. B. 39 Wellington Rd., Edgbaston.
BALFOUR, Rt. Hon. A. J. M.P. Whittinghame, Prestonkirk, N.B.
BARKER, T. Elm House, Northallerton.
BARRETT, Thomas L. Peterborough.
BATTEN, R. Coldrenick, Menheniot, Cornwall.
BRADMONT, W. W. Melford, Palace Rd., Tulse Hill, S.W.
BLACKSHAW, J. Holly Bank Farm, Marton, Chelford, Cheshire.
BLAKE, George. Wellfield, Llanelly.
BLAKE, P. Tidford, St. Germans, Cornwall.
BLAKE, T. V. Pound, Landrake, St. Germans.
BOND, P. G. 105 Union Street, Plymouth.
BOWER, T. Park Road, Nantwich.
BOWYER, E. W. High Legh, Kentsford.
BRADSHAW, F. Lifton Park, Lifton, Devon.
BRADSHAW, G. B. Lifton Park, Lifton, Devon.
BRITTON, F. Shermanbury Grange, Henfield, Sussex.
BROOK, A. J. Brook Lodge, Bexhill, Hastings.
BROWN, George. Bingham, Notts.
BRUNTON, S. Frogmore House, St. Albans.
CARLTON, T. W. 80 Canfield Gardens, N.W.
CARTWRIGHT, T. W. Ragnall Hall, Dunham-on-Trent.
CHICHESTER, W. H. Grenofen, Tavistock.
OLDENSON, H. J. Montagu. Shiplake, Henley-on-Thames.

COAD, J...Treleage, St. Keverne, Cornwall.
 COAD, N...Pengelly, Linkenhorne, Callington.
 CONGDON, J...St. Keyne, R.S.O., Liskeard.
 CONGDON, J. E...East Love, R.S.O., Cornwall.
 COOKE, J. W...Hirdrefaig, Llangeftai, Anglesey.
 DAVENPORT, W. Bromley, M.P...Capesthorpe, Chelford, Cheshire.
 DIVETT, J. R...Tavistock, Devon.
 EDWARDS, W. T. A... (Port Louis, Mauritius), B. A. College, Cirencester.
 EVANS, W. P...Caldwell, near Nuneaton.
 FIRTH, F. H...Cator Court, Ashburton.
 FITZGERALD, Lieut. R. P., R.N...North Hall, Basingstoke.
 FOX, T. H...Oak House, Farnborough.
 FOX, W. St. John...Beechwood, Farnborough.
 GEAKE, T. H...12 Sussex Place, Plymouth.
 GOTHORP, G...Clapham Lodge, Londonderry, Bedale.
 HAMAR, R...Brampton, Aston-on-Cliun, Salop.
 HANNAFORD, P...Plymouth.
 HARRIS, A...The Cedars, Leighton Buzzard.
 HEATLEY, J...The Chestnuts, Eaton, Market Drayton.
 HENDY, James...Probus, Cornwall.
 HILL, J. H...Newtake, Staverton, Totnes.
 HODGSON, B. J...Spennithorne, near Bedale.
 HORN, C...Blowiscombe, Yelverton, R.S.O., Devon.
 HOWEY, Major J. E. W...The Grange, Woodbridge.
 JAMES, W...Barteliver, Grampond Road, Cornwall.
 KENMARE, Earl of...Killarney Ho., co. Kerry.
 LANGTON, Charles...Barkhill, Liverpool.
 LOPES, Right Hon. Lord Justice...8 Cromwell Place, S.W.
 LUSCOMBE, W...Hall Farm, Harford, Ivybridge.
 MATTHEWS, F...Fifield, Chipping Norton.
 NESBITT, E. J. Beaumont...Tubberdaly, Bden-derry, King's Co.
 NEWTON, M. H...Castle Freke, Clonakilty, co. Cork.
 PAIGER, R. H. Treboul...St. Germans, Cornwall.
 PARKER, R...Tredise, Eshelock, Cornwall.
 PENNANT, A. D...Lillingstone Dayrell, Bucks.
 PERKIN, J...Obbery, Tavistock.
 PERRY, J. D...Tavistock.
 PITT, W. jun...Trevelmond, Liskeard.
 POWELL, Miss C. M...Maesgwynne, Whitland, Carmarthen.
 PYBUS, H...Hook House, Kirkby Fleetham, Bedale.
 RADNOR, Countess of...Longford Castle, Salisbury.
 ROBERTS, J. Rice...Tanygraig, Pentraeth, Anglesey.
 ROBINSON, C...Tollasby Farm, Middlesbrough.
 ROGERS, Capt., J.P...Penrose, Helston, Cornwall.
 RUGG, T. S...Corton, Upton Lovell, Bath.
 SA. AUBRY, Edward...Glyn, Bodmin.
 SMITH, E. A...Thorpfields, Thirsk.
 SMITH, G. A...The Place, Haverrill.
 SNELL, W. B...North Wayton, Hail, Cornwall.
 STEVENS, Thomas...Kington-on-Thames.
 STEDEN, F. L...Lea End, Alvechurch.
 STRAKSTON, T...Masham, R.S.O., Yorks.
 THODY, W. J...Hatfield, Herts.
 THORPE, C...Hartford, Cheshire.
 TRUNINGEN, U. B...B. A. College, Cirencester.
 TRYON, Mrs...Bulwick Hall, Wansford.
 TUCKER, E...Molenick, St. Germans, Cornwall.
 WATSON, J...Wentbridge Lodge, Pontefract.
 WILKINSON, G. G...Leicester House, Great Dover Street, S.E.
 WILLIETT, Rev. F...Bedale, Lindfield, Sussex.

WILLIAMS, A...The Gulf, Dagenham, Essex.
 WOODS, M. H...Ote Hall, Wivelsfield, Sussex.
 WRIGHT, E...31 Victoria Park Road, E.
 WRIGHT, Dr. E. P...Trinity College, Dublin.

Nominations of New Members.

Sir NIGEL KINGSCOTE said he desired, with the Council's permission, to anticipate his usual annual motion with regard to the admission to the privileges of membership of new candidates for election. As the Show was now held earlier in the year, it was found advantageous that the subscriptions of new members should be paid as early as possible before the transference of the Society's offices to the showyard. He moved, therefore:—

"That the Secretary be authorised to receive nominations of members, and to admit them to the privileges of membership for the Plymouth Show, on condition that they sign the usual contract and pay their subscription for the current year."

This motion was adopted.

The reports of the several Committees were then presented and adopted, as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the month of April, as certified by the Society's accountants, showed total receipts amounting to 3,715*l.* 0*s.* 1*d.*, and an expenditure amounting to 3,500*l.* 12*s.* 5*d.* The balance at Bank on April 30, allowing for cheques outstanding, was 7,279*l.* 5*s.* 2*d.* Accounts amounting to 3,501*l.* 14*s.* 11*d.* had been passed, and were recommended for payment. The Committee recommended that the names of thirty-eight life and thirty-two annual members whose deaths had been reported to the Society, of twenty members who had resigned, of seven whose addresses could not be found, and of fourteen in arrears be struck off the Society's books. Also that one member whose address had been found be reinstated.

The Committee recommended that a reprint be made of the alphabetical list of Governors and Members as at the completion of the Society's fiftieth year of corporate existence (March 26 last), the copies already printed hav-

ing been exhausted, and there being already a considerable number of applications from members for copies, which could not be complied with. The Committee suggested that opportunity be taken of printing in this list a statement of the Presidents, Trustees, Vice-Presidents, and Members of Council of the Society since its establishment.

Combination Picture of the Council.

Sir NIGEL KINGSCOTE remarked that the Combination Picture of the Council and Officers of the Society at the Windsor Show of 1889, which included portraits of Her Majesty the Queen and the Prince of Wales, was now completed, and copies would be available immediately on application to the photographer, Mr. Barraud, of 263 Oxford Street. The ordinary size of the picture would cost a guinea, or, framed, 1*l.* 15*s.*; but a larger size would also be published, the price of which would be five guineas.

Journal.

Earl CATHCART (Chairman) reported that the Editor had submitted a list of the proposed articles and notes for the forthcoming number of the Journal, which had been approved. Mr. Whitehead's revised edition of his pamphlet, *Hints on Vegetable and Fruit Growing*, had now been issued from the press as a sixpenny pamphlet. The purchase for the library of Messrs. Macmillan's new Library Reference Atlas of the World had been authorised. Various suggestions for articles in future numbers of the Journal had been considered, and directions thereon given to the Editor.

Chemical.

Viscount EMLYN (Chairman) presented the report of the Committee, which included details of the experiments on the feeding of bullocks and sheep at Woburn, and on the sale of the animals. These results will be published in the Journal [see page 399].

Seeds and Plant Diseases.

Mr. WHITEHEAD (Chairman) presented a report by Miss Ormerod, the Society's Consulting Entomologist [which is embodied in the paper published on page 407.]

Mr. WHITEHEAD, in reference to Miss Ormerod's very interesting report, containing an account of the caterpillars which were now devastating the fruit-trees of this country, said it was very difficult to find effectual remedies against these pests. The Agricultural Department in America, where these caterpillars were very troublesome, recommended the use of arsenite of copper. Miss Ormerod reported that the Experiment Committee, lately formed at Evesham, had decided to recommend the use of this arsenical poison in the form of Paris green or London purple. Under the supervision of that Committee these two deadly poisons had been tried on fruit-trees with, so far, signally good effect. Of course it was highly dangerous for the poisons to be scattered broadcast all over the country, and one could not advise too much caution in their use. With regard to the Paris green, the proportion which should be used was one ounce of the poison to twenty gallons of water for apple-trees, and one ounce to eight or ten gallons of water for plum-trees. One pound was supposed to be enough for from 140 to 280 gallons of water. Experiments had been made with London purple in the fruit plantations of Kent. In one instance the solution had been too strong, and it had not only killed the caterpillars, but had scorched up the trees. This showed how very careful they should be. At the same time a fair and proper trial of these poisons might avert a plague of caterpillars. They had had for the last three years caterpillars innumerable, and if not checked by some means they would have a very disastrous effect.

Mr. HAMOND having raised the question of the effect of the poisons upon the birds which live upon the caterpillars, and the Earl of RAVENSWORTH of their employment upon trees under which animals might be feeding,

Mr. WHITEHEAD replied that with regard to the birds the caterpillars were so very small and so embedded that the birds were hardly able to get at them. There was not the least danger of the birds being affected in that way, at all events in the early stages. With regard to the question

of the noble Lord, instructions had been issued by the Board of Agriculture that it would not be safe to use the poisons on trees under which was pasture.

Mr. DENT asked whether this caterpillar was the same as that which infested the oaks, and remarked that if people were not so fond of catching all the tits, bullfinches, &c., these pests would not be so numerous. It was to the brutality of gardeners in slaughtering every bird they could that the great increase of insects was to a large extent due.

Mr. WHITEHEAD answered that the caterpillar referred to was not of the same species. Its habits were somewhat, but not exactly, similar. As to the slaughter of birds, that had caused to some extent the increase of these caterpillars; but it would require all the birds in the world to deal with the enormous swarms of caterpillars which had been infesting fruit-trees for years.

The Earl of RAVENSWORTH asked whether any careful investigation had been made into the outbreaks of these caterpillars; whether early frosts had any effect upon them; and whether there were any data in regard to them.

Mr. WHITEHEAD replied that there were swarms of these caterpillars about fifteen or sixteen years ago. They then ceased for some years. The last three or four years they had again increased, and seemed likely to stay longer. Early frosts had little or no effect upon the swarms of grubs. The action of frost might make the food less palatable to the caterpillars, but no experiments had been tried on this point. They had just the same trouble in America, where caterpillar and insect pests had increased wonderfully within the last few years. If the Americans had not adopted these poisonous solutions to kill the various insects, they really would have had no crops at all.

Veterinary.

Sir JOHN THOROLD (Chairman) presented the following report by Professor Brown:—

PLEURO-PNEUMONIA.—During the five weeks ended April 26, there were thirty-two fresh out-

breaks of this disease reported in Great Britain, 111 cattle were attacked, and 436 healthy ones which had been exposed to infection were slaughtered. Of these outbreaks, twenty-three occurred in England, in the counties of Cumberland, Durham, Essex, Lancaster, Leicester, London, Middlesex, Norfolk, Notts, Surrey, and York (W.R.). The nine outbreaks in Scotland were in the counties of Aberdeen, Edinburgh, and Forfar. Of the 111 cattle attacked, sixty-nine were in England and forty-two in Scotland, while 315 of the healthy cattle slaughtered were in England and 121 in Scotland.

In Ireland, thirteen fresh outbreaks of pleuro-pneumonia were reported in the five weeks; thirty-eight cattle were attacked and 266 healthy ones in contact with them were slaughtered. These outbreaks occurred in North and South Dublin and Rathdown.

ANTHRAX.—There were ten outbreaks of this disease reported and thirteen animals attacked. These outbreaks occurred in the following districts and on the following dates:—St. Martin's, Stamford, in the Soke of Peterborough, March 27; Bishop Auckland, Durham, and Selby, York (W.R.), both on March 29; Leeds, York (W.R.), April 2; Harby, near Leicester, April 3; Hillfield, Dorset, April 6; Portsoy, Banffshire, Scotland, April 7; Otford, Sevenoaks, Kent, April 12; Bickenhill, near Birmingham, April 19; and St. Leonards, East Sussex, April 22. In Ireland there were no cases of anthrax reported during the five weeks.

SWINE FEVER.—There were 334 fresh outbreaks of swine fever reported in the five weeks; 1,920 were attacked, 844 diseased pigs were killed, 787 died, 137 recovered, and 297 remained alive on April 26. In Ireland thirty fresh outbreaks of swine fever were reported, and ninety-four pigs were attacked.

RABIES.—In England eleven cases of this disease in dogs were reported in the five weeks; they occurred in Essex, Hants, London, Middlesex, East Sussex, and York

(W.R.). In Ireland twenty-nine cases of rabies were returned—twenty-three dogs, five cattle, and one ass.

Professor Brown had also reported the appointment of Mr. P. D. Coghill, of the Laboratory of the Royal College of Physicians, Edinburgh, as Superintendent of the Bacteriological Laboratory and Curator of the Museum which had recently been established at the Royal Veterinary College by the aid of the Society.

The Committee recommended that a grant of 50*l.* per annum for three years be made by the Society towards carrying out the objects of the scheme for the examination and registration of Farriers, subject to the condition that the whole guarantee fund of 200*l.* mentioned in the report of the sub-committee be raised. They also recommended the appointment of Mr. A. W. Mason, of Leeds, as an additional provincial veterinary surgeon for the West Riding of Yorkshire.

On the motion of Sir JOHN THOROLD, seconded by Mr. CLAY, the grant of 50*l.* in aid of the Horse Shoeing scheme was agreed to as recommended by the Committee.

Stock Prizes.

Mr. SANDAY (Chairman) reported that the Committee had had under consideration a number of letters as to the eligibility of exhibits of cattle, and had given directions thereon. A letter had been received from the Shorthorn Society stating that the champion prizes offered by that Society for competition at the Plymouth Show were to be subject to the rules and regulations of the Royal Agricultural Society; and that the Shorthorn Council were of opinion that all the prize animals in each class should be judged for the champion prizes offered by them. The Committee had considered and discussed the whole question of the composition of the Society's annual prize sheet for live stock, and had made some progress therewith. They proposed to continue the consideration of this matter at their next meeting on June 3.

Judges' Selection.

Mr. SANDAY (Chairman) presented the recommendations of the Committee as to filling the only remaining vacancies on the list of Judges for the Plymouth Meeting.

Implement.

Mr. FRANKISH (Chairman) reported that the Allotment Committee had met on April 16, and had allotted the positions in the Implement Department. The amount of shedding allotted was: ordinary shedding, 6,117 feet; special shedding, 1,670 feet; machinery in motion, 1,291 feet = 9,078 feet run, exclusive of open ground space. The Committee recommended that the judging of the implements competing for the Society's prizes at Plymouth commence at 9 A.M. on Tuesday, June 17, and of the new implements competing for the silver medals on Thursday, June 19. The regulations of the trials of threshing machines at Doncaster, as settled at the last meeting, had been issued to exhibitors and others interested. The following letter, which had been addressed to a limited company of which he (Mr. Frankish) was the Chairman, had been read by him to the Committee; and on the motion of the Hon. Cecil Parker, seconded by Lord Bridport, it had been resolved that the letter be entered upon the Minutes and published in the Proceedings of Council; and that the thanks of the Committee be given to the Chairman for bringing the matter forward:—

Agricultural Engineers' Association,
13*½*, Coleman Street, London,
April 25, 1890.

DONCASTER SHOW, 1891.

DEAR SIRS,—At a Council meeting held this afternoon of the above Association, the question of the prizes offered by the Royal Agricultural Society for threshing machines at the above Show was considered. At the meeting there were present:—Mr. Ruston, Mr. Clench, Mr. Marshall, Mr. Ransome, Mr. Hornsby; and it was agreed amongst them conditionally that, provided other makers would not compete, they would abstain from doing so. It was also thought

desirable that circulars should be sent bearing the names of those who were conditionally binding themselves not to exhibit, to the whole of the makers of threshing machines, and seeing you were not present or represented, I was directed to write and ask for sanction to place your name on the circular.

Kindly let me have your assent to my so doing and oblige,—Yours truly,

(Signed) COOPER CORBRIDGE,
Secretary.

Messrs. FOSTER & SONS, Lincoln.

A letter dated March 31 from Mr. Ransome to the Secretary, drawing his attention to an extract from the *Engineer* of March 28 as to the proposed prizes for threshing machines at Doncaster had been read and discussed, and it had been moved by Mr. Stratton, seconded by the Hon. Cecil Parker, and resolved, that the following regulation be added to the conditions of trial:—

Should the Judges find any number of exhibits to be of practically equal merit, they are empowered to bracket them as equal, and so divide the prize money.

In presenting this report, Mr. FRANKISH said that as soon as he received the letter which he had read he felt at once the great importance of it. He saw that whatever efforts the Society might make, in order to have a good competition, would be thwarted by the action of the Agricultural Engineers' Association, and he thought it his duty, as Chairman of the Society's Implement Committee, to bring the matter forward for their consideration: and he was sure he was very sorry to have to do so. Firstly, it was necessary for the public to know that if there was a failure in the threshing machine trials at Doncaster, it did not rest with the Society. (Hear, hear.) Secondly, if these great manufacturers did not enter, it might induce many ordinary makers to enter on the chance of gaining a prize. Thirdly, it had been necessary to consider whether, in the face of this opposition, the prizes should be with-

drawn; but this idea the Committee did not entertain. He might mention that although Mr. Ruston's name was amongst those in the letter, his firm had already made an entry for the prizes.

Mr. RANSOME said that before the report of the Implement Committee was adopted he would like to make a few remarks. When the question of offering prizes for the ensuing meeting at Doncaster came before the Implement Committee, and the question was raised as to the class of machines for which such prizes should be given, it was suggested that steam threshing machines, amongst others, should be tried. Personally he was of opinion that there was no satisfactory reason at all why the Society should not have a trial of threshing machines at the Doncaster Meeting. He, therefore, offered no opposition to it, but, on the contrary, at that time he personally expected his own firm would compete, and he had every reason to suppose that, with the large sum of money offered for the prizes, and with suitable conditions, there would be a good competition. He, therefore, rendered all the assistance he could to make the trials when they came off as perfectly complete as possible, and he took rather active steps on the Implement Committee in connection therewith.

However, when the prizes were made known, and when they came before the manufacturers of steam threshing machinery, he found that there was a very strong feeling that it would not answer their purpose to compete for these prizes. The reason was this: Most large makers had had their machines tested in every county in England, Ireland, and Scotland, in all parts of the world, on thousands of farms with millions of acres of grain, and they had established their position as first-class makers with a great deal of trouble, exertion, and expense. So to compete for a prize, however important it might be, offered by the Royal Agricultural Society, and however anxious they might be to obtain it, they had to consider that out of twenty competitors only one could be placed at the top of the tree, and nineteen must be placed as inferior. That was a very

important question for manufacturers to consider, and when it came before the manufacturers of these machines they saw that it would not answer their purpose to compete for the prizes.

With regard to the letter which had been brought before them, he was not aware until yesterday that the Chairman of their Implement Committee was a Director and Chairman of one of the large engineering firms, as a member of which the letter had been addressed to him. That letter he (Mr. Bansome) considered a perfectly private communication. Mr. Frankish had thought it his duty to bring it before them, and he had nothing further to say, but he should not feel that he did his duty if he did not protest against this letter being made public. Occupying the position of Chairman of the Company, Mr. Frankish knew that his firm, or rather some of the members of it, were members of the Association. As the Society had a perfect right to issue prizes without consulting the Engineers' Association, so the Engineers' Association had a perfect right to decide whether they should compete or not. Mr. Ruston's name was in the letter, and the entry which Mr. Frankish had alluded to was made informally, and, he believed, without Mr. Ruston's own knowledge.

Under these circumstances, he thought the Agricultural Engineers were quite justified in consulting one another as to whether they should enter into this competition or not. The Society had been perfectly fair to meet them in having published the conditions, and they had this time certainly consulted the makers as to what the points of excellence should be. Whether these firms competed or not there would certainly be some firms enter for the competition, and the conditions should be as perfect as possible.

Mr. FRANKISH said the letter was not marked private in any way, and even if it had been, he considered it his duty to the Society in some way or other to expose what was going on.

Mr. DENT, as one of the oldest members of the Council, as having taken considerable interest in the trials of implements, and remember-

ing the line which had been taken before by his late friend Sir Harry Thompson, wished to express, as an individual, his gratitude to Mr. Frankish for his action in the matter. (Hear, hear.) He was a warm advocate of an extensive and an exhaustive trial by this Society of agricultural implements. The whole action of the Society in giving prizes, and the constant competition in its showyard trial-fields, had done an enormous amount of good in the promotion of improved agricultural machinery. He did not agree with their late friend, Mr. Randell, that the heavy expense in connection with the steam cultivator trials was a proper reason for giving them up. They had recently heard from the Agricultural Press, and he believed from the Association of Agricultural Engineers, how very much this Society was neglecting its duty in not doing as much as it could to promote the prosperity of implements. They had seen the former trials of the Society justly contrasted with the very little encouragement given of late to agricultural machinery. They did nothing now but give a few medals to new implements, many of which did not appear to be of very much worth. When he saw these liberal prizes given for that most important implement, the steam threshing machine, he hoped they were now coming back to the better practice of old times.

He had lately read an account of a large maltster offering prizes for barley which was the least injured for the purposes of malting. They wanted to see whether it was carelessness in working, or whether improved machinery was required to turn out English barley better than any other barley in the world. Just when they were going to do something of the kind, they had brought forward a letter that was called a private letter, and which seemed an attempt on the part of agricultural implement firms to boycott the Society. By no means let the Society give up the idea of giving the prizes. If those gentlemen did not like to try, let them stand out in the cold, and see if there were not as good men behind them. They did not want to get into hot water with the Engineers.

Association—they had been on the point of doing that on several occasions—but he did think that, as the Council were trying to do their best for the agricultural engineers' own business, they ought to stand very firm in the matter.

Mr. HORNSBY wished to state that he had endeavoured to act for the good of the agricultural engineers and of the Society. He thought with Mr. Ransome that, if prizes were offered, it would decidedly be better to have, in the best way possible, a schedule of the prizes that were offered. He thought it might be considered that they, as members of the Committee, were in a position to arrange the prize sheet for the advantage of themselves. He therefore asked the Implement Committee to permit him, before this schedule was published, to bring it before the Agricultural Engineers' Association. In doing this, he did not know but that the members of the Association and the threshing machine makers would compete; and if some of them had decided not to compete, he could only say, as regards his firm, that, commercially, it would not pay them to compete for these prizes. In these times, those that were connected at all with commercial matters knew the depressed state of things, and they could not afford to expend money without they saw, as they considered, some future advantage in it. He was sure the agricultural engineers would thank the Society for the manner in which they had put forward their prizes.

Viscount EMLYN said he must refer to one point which seemed to have escaped attention. No one objected to any firm keeping out of the competition of its own accord, but many of the Council felt strongly that it was hardly fair to the Society that two members of the Implement Committee should have joined with other persons in endeavouring to induce certain firms to abstain from competing at the forthcoming trials.

The report of the Committee was then adopted, and the subject dropped.

General Plymouth.

Sir MATTHEW RIDLEY reported that the band of the Royal Marines

had been engaged to play three times a day during the last four days of the Show. The question of the Sunday Service had been discussed, and the Committee recommended that the details be left in the hands of the Rector of Stoke Damarel for settlement. Applications from the Hunters' Improvement Society, the Shorthorn Society, and the Shropshire Sheep-breeders' Society for permission to hold meetings in the Plymouth showyard were granted on the usual conditions. The Secretary had been authorised to issue to the Local Committee free season tickets for subscribers of 2l. 2s. and upwards to the Local Fund.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the whole of the implement shedding and about 1,700 feet of cattleshedding at the Plymouth showyard were completed, and that 200 horse boxes were built. The grand stand, pavilions, refreshment rooms, and dairy were all in a forward state, and the local committee were laying on the water and making the roads to the entrances. The Gas Company had commenced laying the gas main to the trial yard. The Surveyor's monthly cash statement showed an expenditure of 373l. 1s. 3d., and accounts to be paid for materials amounting to 1,343l. 12s. 7d. The Committee recommended that Mr. J. B. Body be appointed auctioneer for the sale of timber after the Show.

Selection.

Earl CATHCART (Chairman) reported that the essential business of the Committee held yesterday had been to consider the name to be submitted to the general meeting on May 22 next as President of the Society for the year 1891. They had had a very unusually large meeting of the Committee, and they were unanimous in their decision. He considered himself fortunate to be the voice of the Committee on this occasion, and he had special pleasure in naming Lord Ravensworth.

The Earl of RAVENSWORTH, who was received with cheers, said he thought it was due to the Council that he should say one or two words in recognition of the very high and the

very undeserved honour they had paid him in nominating him President for next year. He always liked to speak out on these occasions, and he felt that he was truly undeserving of this honour, for, in the first place, he was not to compare with many others who might have aspired to the chair. There were two feelings which weighed very much upon his mind. In consequence of the long Parliamentary career which he had had, and perhaps latterly owing to a little of the laziness which attached itself to growing years, he had not worked on that Council so much as might have been expected under other circumstances. Then, he felt that there were many others who had done vastly more work, and whom natural ambition might have induced to offer themselves or to have been considered as candidates for this post. He was afraid he had neither the ability nor the practice necessary to conduct with honour or credit the transaction of the business of such a Society. His chief qualification was his seniority, and this he could not help. In the time to come he would have the opportunity of making up a little lee-way, and he might be able, and he certainly intended to try—to show the Society how greatly he was interested in it; and he should endeavour to conduct himself in such a manner as to maintain that high standard of dignity to which the Society had attained under previous Presidents. Feeling so very strongly as he did, and having the greatest aversion to be brought into a prominent position, he yet accepted with gratitude the honour proposed to be conferred upon him; though he felt himself very unworthy to fill the high office of President of their great Society. (Cheers.)

Vacancies on the Council.

The SECRETARY reported that for the two vacancies on the Council, to be filled up at the general meeting on May 22 next, the three following gentlemen had been nominated:—

Lord BROUGHAM AND VAUX, Brougham Hall, Penrith.

Proposed by Mr. S. P. Foster.
Seconded by Sir Jacob Wilson.

Mr. JOSEPH BEACH, The Hattons, Wolverhampton.

Proposed by Mr. J. Bowen-Jones
Seconded by Sir J. Spearman, Bart.

Mr. E. J. BEALE, Stoneydeep House, Teddington Grove.

Proposed by Mr. John King.
Seconded by Mr. T. B. Lennard and Mr. Edward Prentis.

Date of Country Meeting.

The SECRETARY read a letter from the Royal Counties Agricultural Society enclosing the following resolution:—

That the Secretary be instructed to write to the Council of the Royal Agricultural Society of England to draw their attention to the fact that they have this year fixed the date of their Plymouth Meeting in the week in which it has been customary to hold the Meetings of the Royal Counties Society for the past twenty-five years, and further to request the Council of the Royal Agricultural Society to receive a deputation from this Society, so that a mutual understanding may be arrived at regarding the dates of future Meetings.

After some discussion, in which Sir Jacob Wilson, Mr. Dent, Sir Matthew Ridley, Sir Nigel Kingscote, the Earl of Ravensworth, Earl Cathcart, Mr. Stratton, and Mr. Pell took part, it was resolved, on the motion of Sir MATTHEW RIDLEY, seconded by Sir JACOB WILSON, that the Secretary be instructed to reply that, whilst the Council are of opinion that it would not be possible to alter the date of their annual Country Meetings, they would be willing, should the Council of the Royal Counties Agricultural Society desire it, to receive a deputation on the subject.

Country Meeting of 1892.

On the motion of Sir JACOB WILSON, seconded by Mr. CHANDOS-POLE-GELL, it was resolved that the Country Meeting of 1892 be held in District F, which consists of the counties of Gloucester, Hereford, Monmouth, Salop, Stafford, Warwick, Worcester, and of South Wales.

Date of next Meeting.

Other business having been transacted, the Council adjourned until Wednesday, June 4, at 10.30 A.M.

WEDNESDAY, JUNE 4, 1890.

LORD MORETON (PRESIDENT) IN THE CHAIR.

PRESENT:—

Trustees.—General Viscount Bridport, K.C.B., Earl Cathcart, Mr. J. D. Dent, Sir Nigel Kingscote, K.C.B., Duke of Richmond and Gordon, K.G., Earl of Powis, Sir Matthew White Ridley, Bart., M.P.

Vice-Presidents.—Earl of Feversham, Mr. Walter Gilbey, Right Hon. Sir Massey Lopes, Bart., Earl of Ravensworth, Earl Spencer, K.G., Mr. C. Whitehead.

Other Members of Council.—Mr. G. M. Allender, Mr. Alfred Ashworth, Mr. Joseph Beach, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. Charles Clay, Earl of Coventry, Mr. Percy Crutchley, Mr. Alfred Darby, Viscount Emlyn, Mr. S. P. Foster, Mr. William Frankish, Mr. Anthony Hamond, Mr. James Hornsby, Earl of Jersey, Mr. T. H. Miller, Mr. P. A. Mantz, M.P., Hon. Cecil T. Parker, Mr. Albert Pell, Duke of Portland, Mr. S. Rowlandson, Mr. G. H. Sanday, Mr. Henry Smith, Sir Joseph Spearman, Bart., Marquis of Stafford, Mr. Garrett Taylor, Mr. Jos. P. Terry, Mr. R. A. Warren, Mr. E. V. V. Wheeler, M. C. W. Wilson, Sir Jacob Wilson.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Mr. E. W. Yoelker, Acting Consulting Chemist; Mr. Wilson Bennison, Surveyor.

The following members of the Plymouth Local Committee were also present: The Mayor of Plymouth, Mr. Edward St. Aubyn, Mr. Thomas Pitts, jun., and Mr. J. R. Venning (Town Clerk of Devonport).

Election of Members of Council.

The minutes of the Council held on May 7 last having been read and confirmed,

The PRESIDENT officially announced that the result of the election of twenty-five Members of Council, held on the 22nd ult., was that the twenty-three retiring Members of Council were re-elected, and that Lord

Brougham and Vaux, and Mr. Joseph Beach, of The Hattons, Wolverhampton, had been elected to fill the other two vacancies.

Earl CATHCART introduced the two new Members to the Council, and said that they had great pleasure in welcoming Lord Brougham and Mr. Beach there that day.

Election of Governors and Members.

The election of the following two Governors and thirty-five Members was then proceeded with:—

Governors.

REVELSTOKE, Lord. . .Membrand, Plymouth.
ROTHSCHILD, Lord. . .148 Piccadilly, W.

Members.

ALEXANDER, Lt.-Col. W. J. . . Acton, Poyntzpass, Ireland.
ARMYTAGH, F. R. . . 4 Pump Ct., Temple, E.C.
BAILEY, T. . . 25 High Street, Hull.
BECK, A. C. . . Sandringham.
BENTINCK, Count Charles. . . Amerongen, Netherlands.
BOOTH, G. . . Bushwood, Henley-in-Arden.
BRETT, J. jun. . . 45 St. James St., Nottingham.
BUBBES, A. T. . . 80 Brayford Road, Peckham, London, S.E.
BURTON, J. B. . . Winton House, Alfriston, Folegate, Sussex.
CHURCH, C. C. . . Williamsate, Banbury.
CRABTREE, H. . . 30 Luton Place, Edinburgh.
DAVIS, F. . . Woolas Hill, Pershore.
DUDLEY, E. . . The Hermitage, Melton, Suffolk.
FRISBY, H. . . 14 James Street, S.W.
GRAFTON, F. F. . . 31 Portland St., Manchester.
GRAHAM, W. P. . . Woodmans, King's Langley.
HAYDON, R. W. . . Gt. Coombshead, N. Molton.
HENDERSON, R. . . Portland Estates Office, Kilmarnock, N.B.
HILLMAN, J. . . 65 Torrington Square, W.C.
HUTTON, Capt. H. . . Union Club, Trafalgar Sq London, W.C.
INMAN, A. H. . . 67 Lombard Street, E.C.
JEFFREY, J. J. . . Blackaddie, Sanquhar, N.B.
LANE, R. O. . . Rothwell, Kettering.
LANG, J. D. . . Knowle, Sidmouth, Devon.
LYNE, R. W. . . Barton, Marlborough, Wilts.
MOLSEWORTH, Rev. Viscount. . . St. Petrock Minor, Cornwall.
MORRISON, M. . . Eton Hall, Stockton-on-Tees.
PALMER, H. W. . . Farnleigh, Abbeyleix, Queen's County.
PERCE, E. G. . . Oak Street, Shrewsbury.
PRIEST, J. C. . . Lannock, Weston, Stevenage.
TAYLER, S. W. . . All Cannings, Devizes.
TREVETHAN, J. . . Beer Barton, Ryeborough, Devon.
VAN RAALT, C. . . Aldenham Abbey, Watford.
WOOD, M. . . Low Easingham, Masham, Yorks.
WOOD, T. . . The Philippines, Brasted, Kent.
* Life Member by Examination.

Honorary Members of the Society.

The PRESIDENT announced with regret the death of Mr. Edward Tesdorpf, of Ourupgaard, Falster, Denmark, who had been one of the Honorary Members of the Society since the year 1877.

Subsequently, on the motion of Earl CATHCART, seconded by Mr. CHARLES WHITEHEAD, it was unanimously resolved that the honorary membership of the Society be conferred upon M. Henry de Vilmorin, of Paris, in recognition of his eminent services to European agriculture. M. de Vilmorin's diploma of honorary membership was sealed at the meeting with the official seal of the Society, and signed by the President and the Secretary.

The reports of the various committees were then presented and adopted as below:—

Finance.

Sir NIGEL KINGSNOTE (Chairman) reported that the accounts for the month of May, as certified by the Society's accountants, showed receipts amounting to 2,254*l.* 5*s.* 1*d.*, and expenditure amounting to 3,504*l.* 2*s.* 3*d.* The balance at the Bank on May 31, allowing for cheques outstanding, was 6,029*l.* 7*s.* 7*d.* Accounts amounting in all to 4,423*l.* 0*s.* 10*d.*, had been passed, and were recommended for payment. The Committee recommended that the names of twelve life, eight annual, and one honorary member, whose deaths had been reported to the Society, of eight members who had resigned, three whose addresses could not be found, and four in arrears (in all thirty-six), be struck off the Society's books.

House.

Sir NIGEL KINGSNOTE (Chairman) reported that the Committee, having carefully considered the inadequacy of the Council room for any large assemblage at the general meeting of members, had resolved to recommend that these meetings be held in future in the large hall of the Royal Medical and Chirurgical Society, at 20, Hanover Square. This hall would seat 300 to 400 people, and was only a few yards from the Society's house.

Journal.

Earl CATHCART (Chairman) reported a further reprint of Mr. Whitehead's "Hints on Vegetable and Fruit Farming," and stated that a list of the contents proposed for the forthcoming number of the Journal had been submitted by the Editor and approved. The Committee recommended that the price of available back numbers of the first two series of the Society's Journal be fixed for members at 3*s.* 6*d.* each number, the present publishing price of the new quarterly series. A request for permission to reproduce in the "Veterinarian" Professor Flower's article on "The Evolution of the Horse" had been granted upon the usual conditions. A letter had been received from the Meteorological Office asking whether any changes were desired in the names of recipients of the Hay Harvest Forecasts for this year, and the Secretary had been instructed to reply in the negative.

Chemical.

Viscount EMLYN (Chairman) presented the quarterly report of this Committee (see page 414), which was ordered to be published with the proceedings of Council and in the next number of the Journal.

Mr. WARREN said that a few members of the Woburn Sub-committee went down to visit the Experimental Farm on the 21st of last month, and they were glad to find that the experiments were very well managed under Mr. Elliott. But it seemed desirable that there should be at least two official visits to the farm by members of the Sub-committee during the year, and he should like to propose that it be an instruction to the Woburn Sub-committee that some of its members should visit the Experimental Farm again this summer, and that there should be two official visits each year.

Mr. PELL seconded, and at the same time said that, as a member of the Chemical Committee attending almost all the meetings, he desired to say how very much the useful action of the Council was impeded by members of the Society refusing to give them all the information which was neces-

sary for making an exposure of cases of adulteration and false trade. In the report brought up that day they had been very much hampered by the desire of members not to let their names or the names of the traders appear, after they had satisfied themselves that without any doubt there had been imposture and fraud; and it was really rendering the Society much less useful than it might be. He made these observations in the hope that, by their becoming in some degree public, members of the Society might regard it as a matter of duty to assist the Chemical Committee by permitting them to make disclosures which were thought necessary in the interests of fair trade. Speaking for himself, he feared that in some instances money passed between the agents of members and the fraudulent traders, between whom there was an implied understanding that the matter was to be hushed up. The Chemical Committee must afford to the members of the Society all the privileges which the Society advertised, but by withholding names members were making the action of the Society less efficient. That was his reason for calling attention to the matter that day.

Mr. Warren's motion was then agreed to.

Seeds and Plant Diseases.

Mr. WHITEHEAD (Chairman) stated that the Consulting Botanist had reported the progress of his inquiry into the composition of ancient pastures, and the Committee had sanctioned his proposed visits for the investigation of those which he might consider desirable for the purpose. Miss Ormerod had presented a report (embodied in the report on page 407) which the Committee recommended for publication.

He (Mr. Whitehead) remarked upon the importance of Miss Ormerod's report as showing the continued attacks of the caterpillar pest on fruit trees, and the use of Paris green and other arsenical poisons to destroy them. No doubt these arsenites, if used properly and carefully, would prove an efficacious remedy.

Veterinary.

Mr. DENT (in the unavoidable absence of the Chairman, Sir John

Thorold) presented the following report from Professor Brown:—

PLEURO-PNEUMONIA.—During the four weeks ended May 24 there were forty-one fresh outbreaks of this disease reported in Great Britain: thirty-six of them in England, in the counties of Chester, Cumberland, Essex, Kent, Lancaster, Leicester, London, Northampton, Surrey, and York (W.R.). The five outbreaks in Scotland occurred in Edinburgh, Fife, Forfar, and Renfrew. The total number of animals attacked was 176, and 804 healthy cattle in contact with the disease were slaughtered. In Ireland eleven fresh outbreaks were reported in the four weeks, forty-one cattle were attacked, and 240 exposed to the risk of infection were slaughtered.

ANTHRAX.—In the four weeks twenty-one outbreaks of anthrax were reported, nineteen in England and two in Scotland. These outbreaks in England occurred at the following places and on the following dates:—Lichfield, April 27; Northampton, May 1 and 7; Basingstoke, May 3; Osoford, Suffolk, May 7; North Walsham, Norfolk, May 9; Hensall, near Selby, May 11; Liskeard, Cornwall, and Kendal, Westmoreland, May 16; Skelton, Cumberland, East Retford, Notts, and Stourbridge, Worcestershire, May 17; Bishop Auckland, Durham, Bacup, Lancashire, and Rothbury, Northumberland, May 19; Bentham, Kirkby Lonsdale, May 21; Litton Cheney, Dorchester, May 23. The two outbreaks in Scotland occurred in Aberdeenshire, May 17, and Wigtown, May 18.

The number of animals attacked was 113, of which one was killed, fifty-two died, and forty-seven recovered. In Ireland there were two outbreaks of anthrax, and two animals attacked.

SWINE FEVER.—There were 426 outbreaks of this disease reported in the month. This is an increase as compared with the preceding four weeks, but a decrease as compared with the corresponding period of last year. The number of pigs attacked was 2,453; 961

diseased swine were killed, 1,037 died, 157 recovered, and 444 remained alive when the return was made up. In Ireland thirty outbreaks of swine fever were reported in the four weeks, and ninety-four pigs were attacked.

RABIES.—In England there were ten cases of this disease reported, one in Derby, three in Hants, one in Surrey, and five in York (W.R.). In Ireland there were thirty-one cases of rabies returned, twenty in dogs, seven in cattle, two sheep, one pig, and one goat.

Letters had been read from the Worshipful Company of Farriers forwarding a resolution of thanks for the Society's promised contribution of 50*l.* annually for three years, towards carrying out the objects of the scheme for the examination and registration of farriers or shoeing smiths, and reporting that the sum of 1,300*l.* had up to the present time been subscribed towards the probable expenses of working the scheme. Consequently the conditions mentioned in the report of the sub-committee (*viz.* that at least 1,000*l.* shall have been collected before commencement of registration) had been fulfilled. The Committee therefore recommended that the following six representatives of the Society be appointed to serve upon the General Registration Committee, in accordance with the provisions of the scheme:—The President of the Society for the time being, the Chairman of the Veterinary Committee for the time being, Mr. Charles Clay, Mr. Walter Gilbey, Sir Jacob Wilson, and the Secretary. The Secretary had reported correspondence with the veterinary authorities of Dublin Castle as to the necessity of permits issued by them for the return to Ireland of cattle exhibited at Plymouth, and as to the furnishing of certificates to the effect that such cattle are free from disease at the closing of the show. The Committee reported the death of Mr. Hugh Jones, of Llangefni, the Society's Provincial Veterinary Surgeon for the county of Anglesey, and they recommended that Mr. Owen Thomas, of Tycoch, Llanerchymedd, be appointed in his stead.

Mr. DENT observed that, with reference to the cases of anthrax

reported, Professor Brown believed many of the cases were not anthrax; because the Professor did not consider that forty-seven would have recovered, as stated. It would probably, therefore, be some other disease reported as anthrax. With reference to pleuropneumonia, the return was exceedingly unsatisfactory. The county of Cumberland appeared to have become a sort of sink of infection; and the disease had spread from there to many other places.

Mr. FOSTER said that the great trouble they had to contend against in Cumberland was to find out the disease, the existence of which was concealed. They believed the disease had existed in several places for the last twelve or eighteen months, but they had to prove that it was there before they were able to deal with it.

Earl SPENCER said that, as they had heard what had been said about Cumberland, he wished to state the difficulties which they experienced in the county of Northampton. One difficulty was in the endeavour to trace the source of the disease. They found that in that county the disease almost invariably broke out amongst cows or heifers, and he believed—they could not actually prove it, but they had considerable evidence to show—that the disease almost always arose from what were called shed cattle. It was an exceedingly difficult matter to trace the disease. They found that the dealers absolutely refused to give any evidence whatever as to where they got their cows. The difficulty, therefore, of any attempt to stop this trade in shed cows was immense. How this was to be done was a very grave question, and he would like to have heard the opinion on the subject of some of the experienced gentlemen who sat in that room. In Ireland, in the Dublin dairies, and in Scotland, in the Edinburgh dairies, he used to hear the same thing as to the exceeding difficulty of this question. They might have better inspection of dairy sheds in the towns, not only with regard to the sanitary condition of the dairies, because that, he imagined, was really now the object of inspection, but also with regard to the movement of the animals. Whether this should be included in the new

Act which the Minister of Agriculture was about to put into force he was not prepared to say; but he thought something in that direction must be done. The disease increased just at the time when the Minister of Agriculture was going to take the matter up. He did not know whether Mr. Chaplin would be able to trace better than they could the source of the disease, but if he could not his task would be an exceedingly difficult one.

Mr. DENT said the outbreaks almost invariably occurred in dairy cows. In their division they had been carrying out the Act in a most stringent manner, and they thought they had obtained some mastery over the disease; but it still lurked and lingered about in the dairies, and was communicated by the cows from one dairy to another. It was almost always amongst the cows, and this led to the slaughter of valuable dairy herds and of young cattle brought into contact with them.

The Earl of RAVENSWORTH referred to the great difficulty there was to get the Borough Councils, who were the governing bodies in the boroughs, to co-operate cordially in a matter of this kind. That in his experience was the great difficulty they had to contend with. Unless they got that perfect co-operation between town and county it was absolutely impossible to trace the disease.

Sir JACOB WILSON concurred with the remarks of the previous speakers, which, he said, showed how much justification there was for the Bill now before Parliament. It proved that the real curse had been the concealment of the disease. Whilst, as things stood at present, the Act might be well administered by the local authorities of any district, they had no power to act beyond their respective boundaries; therefore they could not trace where the disease came from or where it went to. In future, with a central authority, they would be able to trace it throughout the whole country, irrespective of boundaries. Another thing, the Bill took powers of entry into dairies, which they did not before possess. They therefore hoped that this would give them further powers

of discovery. The increase of the disease just now was undoubtedly due to the animals going out to grass and being scattered over the country. If it had been possible for the Bill to come into operation whilst the animals were in the sheds, they would have had a much better opportunity of grappling with the disease. He hoped that when the winter months come on the Government would tackle the subject with energy. Lord Ravensworth had referred to a point which was undoubtedly of great importance. He could point to the borough of Newcastle and to the county of Northumberland as an instance where the authorities worked in thorough harmony; and the result was that when an outbreak occurred it never spread. The same thing applied in Perthshire and Perth. If the two authorities worked together it was possible to prevent the spread of the disease.

Mr. PELL said he could add nothing to what had been stated by Lord Spencer excepting one reason why there was this very great danger connected with the dairy sheds. He believed that no London dairyman had ever applied for compensation. He could assure the Council that the instances—if indeed there were any—of urban dairymen discovering and disclosing the disease and applying the law for compensation were extremely rare, and for this reason: there would be outcries directly on the part of their customers with regard to the sale and purchase of their milk. Therefore, when an urban dairyman found the disease upon his premises, his object was to kill the animal, sell it, get it out of the way, or call in a dealer to purchase the whole herd. The dealer required a certificate of the soundness of the animals; and there were veterinary surgeons in London who were a little obscure about the nature of the disease when called in. The assurance being given that the animals were healthy, the dairy was cleared out, and the cows went down into the country. The virtue attaching to those animals was the price paid by people who knew what a shed animal was by the appearance of the skin. The matter was hedged by the know-

ledge that, if the animals proved to be unsound, there was a security for more than the value being paid for them in compensation. If, on the other hand, they turned out to be sound, then the people thought they had got a good bargain. That was the reason why they had the great danger with the shed cattle. Until there was some special legislation or action taken by the Board of Agriculture with regard to the dairy sheds of the large towns and of the metropolis to prevent these animals going out, or to register them so that they might be identified, the people in the country would have to pay thousands of pounds which they might be well spared. He was very glad Lord Spencer had taken notice of this subject, and he hoped that before many years something would be done to put a check upon this trade in dairy cattle.

Sir NIGEL KINGSFOTE said this showed that the present Bill in Parliament did not go far enough. Until they made it a criminal offence to sell diseased cattle, it would not be possible to stamp it out of the country.

The report of the Committee was then adopted.

Stock Prizes.

Mr. SANDAY (Chairman) reported that the Committee had further considered the composition and regulations of the stock prize sheets of future meetings, and had agreed to a number of resolutions, which they proposed to submit for the approval of the Council when the draft prize sheet for the Doncaster Meeting was under consideration.

Judges' Selection.

Mr. SANDAY (Chairman) stated that the Committee, having had before them a statement of the number of entries in the various classes, were of opinion that the number of judges already appointed would be sufficient.

Implement.

Mr. FRANKISH (Chairman) reported that the Committee had considered the details of the arrangements for the trials of implements at

the Plymouth Meeting, and presented their recommendations thereon.

General Plymouth.

Viscount BRIDPORT submitted various recommendations from this Committee as to details of the arrangements for the forthcoming Meeting at Plymouth, and as to applications received from Breeding Societies for permission to hold meetings in the showyard. Arrangements had been made with the St. John Ambulance Association for the establishment of an Ambulance station in the showyard.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the whole of the implement yard was completed, that a number of exhibits were in position, and others were daily arriving; that the horse-boxes and stock-sheds were in a very forward state, and would be all finished in good time; that the Local Committee were carrying out some works in widening the main road from Plymouth to the showyard, and were laying the temporary sleeper road to the entrances, and that they had completed the laying on of the water and other works inside the showyard.

Education.

Mr. DENT (Chairman) reported that of the seventeen candidates who entered for the Society's Senior Examination, held on May 13 and four following days, sixteen duly presented themselves for examination, the remaining candidate being absent on account of ill-health. Of these sixteen competitors, eleven had satisfied the examiners. Six had gained first-class certificates, and thus became Life Members of the Society, the first four being entitled in addition to the prizes stated below; and five others (Nos. 7 to 11) having passed in agriculture and in three of the four compulsory subjects had been awarded second-class certificates:—

1. Francis Reginald Armytage, 4 Pump Court, Temple, E.C. First prize of 25l.
2. Richard William Haydon, Great Cootinhead, North Molton, Devon. Second prize of 15l.
3. Henry Crabtree, 30 Lutton Place, Edinburgh. Third prize of 10l.

4. Alfred Henry Inman, 9 Queensferry Street, Edinburgh. Fourth prize of 5*l*.
5. John James Jeffray, Blackadifie, Sanquhar, N.B.
6. Richard Henderson, Portland Estates Office, Kilmarnock, N.B.
7. Edward Douglas Malcomson Hamilton, Magherabuooy, Portrush, Co. Antrim.
8. John Arthur Llewellyn Beasley, Aylestone, Leicester.
9. George Pelham Thomas, Hemsworth, Pontefract.
10. James Gunter, Estate Office, Glasbury.
11. George Sharman Mitchell, Cannon Street, Belgrave, Leicester.

The Committee had agreed upon a report, embodying the results of the examination and the chief points dealt with by the examiners, which would be published in the next number of the Journal (see page 421). Two communications had been received from the Charity Commissioners, (1) with reference to the Bromyard Grammar School, stating that the scheme for that foundation had been approved by Her Majesty in Council, and (2) forwarding copies of a draft scheme for dividing the endowment of Jarvis's Charity into two endowments in the parishes of Staunton-on-Wye, Bredwardine, and Letton, and inquiring whether, in the event of the scheme receiving the approval of Her Majesty in Council, the Council of the Society would be prepared to appoint a Governor, as proposed in Clause 6 of the draft. The Committee recommended that the Council undertake this duty upon the completion of the scheme, and that Mr. E. Vincent V. Wheeler be nominated as the Governor representing the Society. Copies of the report of the Joint Committee of the Central Chamber of Agriculture and the Farmers' Club on Technical Education in Agriculture were laid upon the table, and, after discussion, it had been resolved to recommend the Council to agree with the following recommendations of the Joint Committee:—

(1) That there should be established and maintained, at the cost of the State, a Central Normal School of Agriculture.

(2) That State aid should be liberally given to certain endowed and county schools on condition of their establishing an agricultural side for the proper teaching of the theory and practice of agriculture—practical instruction being carried

out on a farm, which might either be the property of the school—or rented by the school—or available by permission of neighbouring farmers. Arrangements should be made for the delivery of courses of lectures by the teaching staff or other lecturers, open to farmers of the district.

(3) That grants should continue to be given by the State in aid of local effort to provide technical instruction in dairy or other branches of farm work.

(4) That aid should be similarly given to local agricultural associations or chambers of agriculture engaged in scientific research.

(5) That in all cases where State aid is afforded, it should be of a permanent character, subject only to certain definite conditions laid down by the Board of Agriculture, and to the admission of annual inspection by an officer of the Board.

(6) That ample facilities should be afforded by the State to enable children in rural elementary schools to acquire knowledge of their future work, either as agricultural labourers or as tenants of small holdings.

Mr. DENT, in moving the adoption of this report, called particular attention to the Committee's recommendation of agreement with the conclusions of the Joint Committee of the Central Chamber of Agriculture and the Farmers' Club upon Technical Education in Agriculture. Time was pressing, since, as they were aware, the new Board of Agriculture had the matter under consideration, and the Council would not wish that the Royal Agricultural Society should be the last in the field to offer any expression of opinion to the new Department. On the whole he thought most of the recommendations made by the Joint Committee were those that he could personally altogether agree in; certainly that State aid should be made to endowed and county schools on condition that they established an agricultural side for the proper teaching of the theory and practice of agriculture, and that aid should be similarly given to local agricultural associations or chambers of agriculture engaged in scientific research.

The establishment of a Central Normal School of Agriculture was, of course, a serious matter. If it were well done, and thoroughly good people placed at the head of it, and a farm established at which different methods of agriculture could be shown to the students, and the students could take a practical part in it and get practical knowledge, it would bring out some good teachers, and it would enable young farmers of some education and young agents to spend a couple of terms for the purpose of improving their theoretical knowledge and adding to the practical knowledge that they already had. On the other hand, if satisfactory persons were not placed at the head of the school, and if the details were not carried out satisfactorily, then it would prove a gigantic failure and do a great injury to agriculture. He did not like the appearance of the Society being behindhand, or not appearing to take sufficient interest in a question which was being considered by the new Board of Agriculture. He therefore moved that the Society should agree in the recommendations of the Joint Committee.

The Duke of RICHMOND and GORDON, whilst agreeing in the importance of the first recommendation, said he should be sorry to see it adopted by the Council on the present occasion, or until they had an opportunity for its further consideration. He suggested that the further discussion of the recommendations of the Joint Committee should be adjourned until the next meeting, and they would possibly be able to ascertain meanwhile whether the Board of Agriculture would be likely to take any steps in the matter and, if so, what steps. It seemed to him a very large question. The last recommendation, "that ample facilities should be afforded by the State to enable children in rural elementary schools to acquire knowledge of their future work, either as agricultural labourers or as tenants of small holdings," would be remarkably difficult to carry out in all the elementary schools of the country. He moved that the paragraph in the report upon this subject be referred back to the Committee for further consideration.

Earl CATHCART seconded this proposal, remarking that he thought if any mistake were made now it would seriously throw them back. If they went to the Agricultural Department with half-considered recommendations, when they went with a really momentous matter they would be received as was the cry of "wolf."

Mr. DENT, on the part of the Education Committee, agreed that it was not satisfactory to discuss hastily so important a matter, and though it would be inconvenient for many of the Committee to attend at a later period, it was better that the subject should be referred back. He proposed that a copy of the report of the Joint Committee of the Central Chamber and the Farmers' Club should be sent to each member of the Council, who would then be able to see upon what grounds the Committee based their recommendations.

The motion that the subject be referred back to the Committee was then agreed to.

Dairy.

The Hon. CECIL T. PARKER (Chairman) reported that seventeen entries had been received for the Butter-making Competition at Plymouth, viz. eight in class 1 and nine in class 2. The final arrangements for the Dairy in the Plymouth showyard had been discussed and settled.

Hunter Stallion.

The Duke of RICHMOND and GORDON (Chairman) presented the report of this Committee as to the services of the Society's premium stallions during the present season. The thanks of the Society were ordered to be sent to the Royal Commission on Horse-breeding for a bound copy of the reports which the Commission have presented to Parliament.

Steward of Forage for Doncaster Meeting.

On the motion of Sir JACOB WILSON, seconded by Mr. FRANKISH, it was resolved that Mr. Charles Clay, of Walton Grange, Wakefield, be appointed Steward of Forage for the Doncaster Meeting.

Mr. CLAY expressed his sense of the

honour which had been conferred upon him, and said that he would do all he could to advance the success of the Meeting.

Suggestions made at General Meeting.

The Council then considered the suggestions made by the members at the General Meeting on May 22 (see page xciii), and agreed, on the recommendation of the several Committees concerned, to reply as follows:—

Mr. GEORGE BARHAM: *(a) That the report should be sent by post to all the members in anticipation of the meeting.*

The Council have on two previous occasions within the last two years reported that it did not appear necessary that the serious expense should be incurred of printing, addressing, and posting to every member the reports to the general meetings. This expense, including the cost of addressing the wrappers, would be from 40l. to 50l. on each occasion. The May report is issued to the daily and agricultural press as soon as the final figures of the entries for the forthcoming country meeting have been ascertained and verified; and the room in which the meeting is held is available after eleven o'clock to members who may wish to attend and consider the report in anticipation of the public meeting. Moreover, if any member who desires to have the report sent to him by post before the meeting will communicate his wishes to the Secretary, a copy will be sent to him as soon as ready. As the report to the December General Meeting is only settled on the previous day, it would not, of course, be possible to make the same arrangements with regard to that report.

(b) That the Implement and Stock Catalogues of the Country Meetings should be issued together in one volume.

It is now too late to make any alteration in the arrangements for the catalogues for the Plymouth Meeting, but the question of amalgamating the two catalogues will be again considered after the recess.

(c) That the refreshment arrangements at the Showyard should be improved.

The Council are at all times desirous of making the refreshment arrangements at the showyards as convenient and satisfactory to members and visitors as possible, and will gladly consider any practical suggestion having this object, regard being had to the necessarily temporary character of the arrangements, and to the fact that most of the visitors resort to the tents at about the same time in the day.

Mr. H. D. MARSHALL and Mr. JOHN RICHARDSON:—*That there should be a larger representation of agricultural implement makers on the Council.*

This question will be only considered by the Committee of Selection as vacancies occur on the Council.

Dates of Forthcoming Meetings.

It was arranged to hold during the Plymouth Meeting a daily meeting of the Council in the Council Pavilion in the showyard at 1 P.M., from Monday, June 23, to Friday, June 27, inclusive. The general meeting of governors and members was fixed to be held in the large tent in the showyard at 12.30 P.M. on Tuesday, June 24. The ordinary monthly meeting of the Council will be held at 1 P.M. on Wednesday of the show week, June 25, in the Council Pavilion, and the final meeting of the Council before the recess at 12, Hanover Square at noon on Wednesday, July 30, 1890.

Proceedings at 51st Anniversary Meeting of Governors and Members.

THURSDAY, MAY 22, 1890.

LORD MORETON (PRESIDENT) IN THE CHAIR.

Present:—

Trustees.—Gen. Viscount Daldry, K.C.B., Earl Cathcart, Lord Egerton of Tatton, Sir Nigel Kingscote, K.C.B., Earl of Powis, Duke of Richmond and Gordon, K.G., Sir Matthew White Ridley, Bart., M.P.

Vice-Presidents.—Right Hon. Henry Chaplin, M.P., Earl of Faversham, Earl of Lathom, Right Hon. Sir Massey Lopes, Bart., Earl of Ravensworth, Sir John H. Thorold, Bart.

Other Members of Council.—H.R.H. Prince Christian, K.G., Messrs. G. M. Allender, James A. Caird, Percy E. Crutchley, C. De L. Faunce De Laune, Viscount Emlyn, Messrs. S. P. Foster, William Frankish, Hugh Gorringe, James Hornsby, Earl of Jersey, Messrs. C. S. Mainwaring, P. Albert Muntz, M.P., J. E. Ransome, Samuel Rowlandson, G. H. Sanday, Alfred J. Smith, Martin J. Sutton, Garrett Taylor, Jos. P. Terry, R. A. Warren, and Sir Jacob Wilson.

Governors.—Messrs. W. A. Tyssen Amherst, M.P., C. C. Cotes, H. W. Freeland, Earl Manvers, Lord Middleton, Mr. W. Barrow Simonds.

Members.—Hon. George Allsopp, M.P., Messrs. Cecil C. Baker, G. Barham, G. Titus Barham, John Barker, E. J. Beale, William E. Bear, Sir Edward Birkbeck, Bart., M.P., Messrs. Walter Blott, H. A. Blyth, John Brazell, W. Briginshaw, Marquis of Bristol, Messrs. A. E. Brooke-Hunt, W. W. Chapman, Philip Chasemore, H. H. Chattock, Matthew Clarke, Thomas Clarke, Henry Clayden, Newton Clayton, Nathaniel L. Cohen, William Cooper, H. S. Cox, Major P. G. Craigie, Messrs. George Culley, R. David, Herbert Dodwell, S. B. L.

Druce, William Dunham, George W. Elliot, M.P., F. M. Evans, William Everitt, Richard Fowler, Dr. W. Fream, Messrs. H. F. Getting, J. C. Getting, George Gibbons, Arthur N. Gilbey, H. W. Gilbey, W. W. Glenny, Argo G. Gold, Henry Gold, W. Hugh Gorringe, John Graham, J. A. Hattersley, W. Hedges, J. A. Hampson, Walter J. Hensman, C. S. B. Hilton, G. M. Hipwell, J. E. Holinshead, R. G. Horwood, H. Howard-Vyse, John Hughes, Surgeon-Major Ince, M.D., Messrs. H. Kains-Jackson, George T. James, A. H. Johnson, George Jonas, Edwin Kay, Frederick King, John King, Nigel R. F. Kingscote, Samuel Kingston, Walter H. Long, M.P., Alexander Macdonald, J. T. McDougall, H. D. Marshall, Sir J. R. Heron Maxwell, Bart., Messrs. T. May, B. Mead, W. Merriman, W. Miskin, J. S. Mott, A. P. Newman, T. H. G. Newton, W. Newzam Nicholson, John Norman, jun., J. C. R. Okes, James B. Page, J. P. Parrott, Hugh Penfold, F. Pickard, Claude M. S. Pilkington, Edward Prentis, Stephen Pullen, Clare Sewell Read, W. R. Robertson, Julian O. Rogers, Henry A. Rolls, K. Sando, A. Seth-Smith, C. H. Sharman, G. F. Sheppard, F. Sherborn, James Sinclair, Elias P. Squarey, J. Stedman, jun., Thomas Stirton, H. M. Stollery, George Stratton, Col. the Hon. W. P. Talbot, Messrs. Charles Taylor, J. Herbert Taylor, John Thornton, M. G. Thorold, F. G. Thynne, W. Toop, John Unite, Sir W. Vavasour, Bart., Dr. Paul Vieth, Messrs. James Walker, Henry Webb, Jonas M. Webb, &c., &c.

The SECRETARY having read the Bye-Law as to the business of the anniversary meetings,

Sir EDWARD BIRKBECK, Bart., M.P., moved that the Earl of Ravensworth

be elected President of the Society for the ensuing year, saying that he was quite sure that the meeting would accept this proposal with acclamation. Lord Ravensworth had been connected with agriculture all his life, and he had been a member of the Royal Agricultural Society since the year 1867. He was confident that the proposal which he submitted would meet with the approbation, not only of all present, but of the whole agricultural community throughout the United Kingdom. (Cheers.)

Mr. THOMAS STIRTON having briefly seconded the motion, it was put to the meeting by the PRESIDENT, and declared carried unanimously.

The Earl of RAVENSWORTH, in reply, said that it was his highly agreeable duty, in the best terms that he could, to return his cordial thanks for the very great honour they had done him in accepting the recommendation of the Council, and unanimously electing him as President for the coming year. He considered it the greatest honour which a member of that Society could aspire to; and he desired to assure them that as far as it lay in his power he would in the capacity of President uphold the dignity of their great and world-appreciated Society. He congratulated the Society upon their good fortune and sound judgment in selecting a place for the country meeting next year. He thought Doncaster was perhaps as favourable a spot in the United Kingdom as any could wish to have been selected. It was in the centre of a great district of agricultural activity, and there were other associations, dear to every Englishman, connected with the old Town Moor of Doncaster, which had made that place a popular resort; and he trusted and hoped that the meeting held there would at least equal in success, if not exceed, any previous meeting of the Society. He returned his most sincere expressions of gratitude for the honour which they had conferred upon him. (Cheers.)

The twelve Trustees and twelve Vice-Presidents having been re-elected by show of hands, the PRESIDENT appointed Sir John Heron Maxwell, Bart., Mr. S. B. L. Druce, and Mr. John Thornton to act as scrutineers of the voting papers for the election of

twenty-five members of Council. These voting papers having been duly collected, the PRESIDENT announced, when the report of the scrutineers had been received, that the twenty-three members of Council who retired by rotation had been re-elected; and that Lord Brougham and Vaux, of Brougham Hall, Penrith, and Mr. Joseph Beach, of The Hattons, Wolverhampton, had been chosen to fill the two remaining vacancies.

The SECRETARY having read the report of the Council to the meeting (see page 393),

The adoption of the report was moved by Mr. W. W. GLENNY, who referred with gratification to the increased number of members, the satisfactory state of the finances, the bringing of the Society into more frequent communication with the general body of members by means of a quarterly instead of a half-yearly journal, and the efforts which the Society had made, in concert with other agricultural bodies, towards placing the slaughter of animals affected with pleuro-pneumonia under Government control, and providing for the payment of compensation out of the Imperial Exchequer. He deprecated the admission of live animals from America, thus spreading diseases which would prove, and which had proved, so baneful to the herds of this country.

Mr. GEORGE BABHAM seconded, and suggested that the report should be circulated to the members beforehand. He criticised the refreshment arrangements at the showyard as a weak point connected with the Society. He suggested that, instead of issuing two catalogues, the implement and stock catalogues should be bound together. If the new American paper were used, the bulk of the book would not be greater than the present stock or implement catalogue. There would be an immense advantage if the particulars of the implements exhibited were in the hands of everyone who took a stock catalogue. There had been a great many remarks in the papers with reference to the expenditure and the loss at the Windsor Show. He would not treat upon that at length, but he would say that no money was better laid out than the money spent

there. The Show was a great and a brilliant success. It was necessary that the Jubilee Show of the Society should be a brilliant success, and he heartily congratulated the Council upon the success of that Show, and upon the expenditure of the money which was required to bring it about. He referred with much gratification to the second contribution by the Council of 50*l.* towards the funds of the Mansion House United Association on Railway Rates, though he thought it would have redounded very much more to the credit of the Society if the contribution had been 500*l.* instead of 50*l.*, considering the powerful bodies which they had to fight and how weak and divided the agriculturists were.

Surgeon-Major INCE moved the following amendment to the report:—

That this meeting, whilst approving the report generally, disagrees with paragraph 23, which expresses gratification in the proposed transfer of the payment of compensation for the slaughter of kine suffering from alleged pleuro-pneumonia from local to imperial funds.

In the course of a speech of some length, he expressed the opinion that the danger from pleuro-pneumonia was greatly overrated by alarmists, who counselled the wholesale slaughter of cattle as the only means of stamping out the disease. He regarded the majority of cases, said to be pleuro-pneumonia, as simply cases of catarrh, and he did not believe there had been a case of true, genuine, virulent pleuro-pneumonia in the country for many many months, if not years.

The amendment having been seconded by Mr. JOHN RICHARDSON, was put to the meeting and immediately negatived, only the mover and seconder voting for it.

The report was then adopted without further discussion.

Alderman JOHN BARKER proposed a vote of thanks to the auditors, Messrs. A. H. Johnson, C. Gay Roberts, and Francis Sherborn, for their services during the past half-year. It was a gratification to know that the Society was prosperous and flourishing, that its numbers were increasing, and that there was a good balance at the bank.

Whatever might be the case as to the refreshment arrangements at the showyard, they would agree with him that there was no weak point in the rendering or auditing of the Society's accounts.

Mr. GEORGE GIBBONS seconded, adding that he hoped he might be allowed to say a few words with regard to a suggestion which he brought before the General Meeting in December last to the effect that the Council would do well to offer prizes for implements. He was very glad to see that that had been done. He had noticed in the daily press some statements made that the agricultural engineers did not seem to favour that proposal. He hoped it was not correct. They had very much to thank the agricultural engineers for in the improvement of their implements during the past forty years. But they were not perfect. Many of them were too costly and too cumbersome—not what they hoped they would be. The fathers of the present implement makers did not despise the good offices of that Society, and they acquired very substantial competences thereby. He trusted that the sons would be equal to their fathers, and he hoped that they would rise to the occasion, and, as a whole, come forward to compete in a manly, straightforward manner for the prizes which were being offered by that Society.

The vote of thanks to the auditors having been carried unanimously,

The PRESIDENT asked if any member had any remark to make or suggestion to offer which might be referred to the Council for their consideration.

Mr. H. D. MARSHALL wished to make one remark with reference to the observations of the last speaker. He was not a very old man, but he was one of the fathers of their own (implement) business, which was a tolerably extensive one. The question of competing was one that lay deeper than the public were aware of. He thought he might say that there was a time when there were six—he believed there were now two—representatives of the implement makers upon the Council. Having regard to the contribution of the

engineers of the country towards the funds of the Society, he did not think that they had been met in a fair or reasonable way. They had been treated with rather scant courtesy. A larger representation upon the Council would be an advantage to the Society, the community in general, and, he thought, to the engineers as well. Their representation had been very inadequate for many years past.

Mr. W. E. BEAR said he had for many years advocated more attention on the part of the Society to the encouragement of new inventions, and also to the improvement of the plants of the farm. The live stock department monopolised too much of the attention and money of the Society. He was glad to think that the Society proposed to go back to its good old practice of former days. But they saw that whilst the Society piped to the implement makers, the implement makers had declined to dance. He was very glad to see that the Council adhered to their plan of having the trials of threshing machines at Doncaster, in spite of the attempts made to boycott them. The Newcastle engine trials—when the same action was taken—brought out some excellent results, and when some of them saw these results, they were disposed to think that those who declined to enter had shown that discretion which they were told was the better part of valour. Upon the present occasion they perhaps saw looming in the distance some redoubtable David whom these Goliaths had reason to fear. Those who occupied high niches in the Temple of Fame were naturally anxious to keep new men from climbing up the stairs. In this connection the interests of the farmer were not at one with those of the great implement makers. They saw at the shows certificates and medals displayed as having been awarded in the past to machines now of an antiquated type, which were best suited for agricultural museums. These signs were conspicuously displayed, and the makers got credit to which they were not now entitled. There ought to be more frequent competitive trials in connection with implements. He

wanted to say this too: That the examination and trials of novelties for the few medals given by the Society were carried out in a very perfunctory manner. There was scarcely time for the judges to get round and see the entries. He might have offered other criticisms; but there had been, if not too much criticism of the Society lately, too much of the wrong kind. It was of a character to make all persons who respected themselves feel particularly friendly towards the Society. In a certain quarter the Society had been criticised in what he could only call a vulgar and bumptious manner, reminding them of the fable of the donkey in the lion's skin, trying to imitate the lion's roar, but only succeeding in emitting a feeble bray, which the Society could afford to treat with contempt.

Mr. JOHN RICHARDSON said he would like to confirm what had been stated by Mr. Marshall, of Gainsborough. Implement makers, whose exhibits formed so large a fraction of the Society's Show, ought to be much better represented. There were now only two representatives of implements upon the Council, instead of six, as formerly. Considering that the Council consisted of about eighty members, he thought that a quarter of the total number should consist of agricultural implement makers.

Mr. CLARE SEWELL READ moved a vote of thanks to the Chairman for presiding, and for the distinguished services which he had rendered to the great national Society. He was quite sure that it was a very great pleasure to those who were old men to see the young ones coming forward in the cause of agriculture, and it was particularly gratifying when they found an honourable representative of one of the first founders of the Society in the chair on the present occasion.

Mr. SAMUEL KINGSTON seconded, remarking upon the business-like manner in which the proceedings had been conducted by the noble Chairman.

Lord MORETON in a few words acknowledged the vote of thanks, and the proceedings terminated.

MEMORANDA.

ADDRESS OF LETTERS.—All letters on the general business of the Society should be addressed to the Secretary, at 12 Hanover Square, London, W.

TELEGRAMS.—The Society's registered address for telegrams is "Practice, London." *Replies by Telegraph cannot be sent unless paid for in advance, and cannot be guaranteed in any case.*

TELEPHONE NUMBER, 3675.

OFFICE HOURS.—10 to 4. On Saturdays 10 to 2.

COUNTRY MEETING at Plymouth, Monday, June 23, to Friday, June 27, 1890 (both inclusive).

GENERAL MEETING in London, Thursday, December 11, 1890, at noon, in the large hall of the Royal Medical and Chirurgical Society, 20 Hanover Square, W.

MONTHLY COUNCIL (for transaction of business), at noon on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

ADJOURNMENTS.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

SUBSCRIPTIONS.—1. *Annual.*—The subscription of a Governor is £5, and that of a Member £1, due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June.

2. *For Life.*—Governors may compound for their subscriptions for future years by paying on election, or at any time thereafter, the sum of £40, and Members by paying £15. Members elected before 1890 may compound at any time on payment of £10 in one sum; and Members elected in or subsequently to 1890 may compound for the same amount after the payment of ten annual subscriptions. Governors and Members who have paid their annual subscription for 20 years or upwards, and whose payments are not in arrear, may compound for future annual subscriptions, that of the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member. No Governor or Member can be allowed to enter into composition for life until all subscriptions due by him at the time shall have been paid.

No Governor or Member in arrear of his subscription is entitled to any of the privileges of the Society.

All Members belonging to the Society are, under the Bye-laws, bound to pay their annual subscriptions, until they shall withdraw from it by notice in writing to the Secretary.

PAYMENTS.—Subscriptions may be paid to the Secretary, either at the office of the Society, No. 12 Hanover Square, London, W., or by means of crossed cheques in favour of the Secretary, or by postal orders, to be obtained at any of the principal post-offices throughout the kingdom, and made payable at the Vere Street Office, London, W. When making remittances it should be stated by whom, and on whose account, they are sent. All Cheques and Postal Orders should be crossed "London and Westminster Bank, St. James's Square Branch."

On application to the Secretary, forms may be obtained for authorising the regular payment, by the bankers of individual members, of each annual subscription as it falls due. Members are particularly invited to avail themselves of these Bankers' orders, in order to save trouble both to themselves and to the Society. When payment is made to the London and Westminster Bank, as the Bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the bankers' book may be at once identified, and the amount posted to the credit of the proper person. No coin can be remitted by post, unless the letter be registered.

JOURNAL.—The Parts of the Society's Journal are (when the subscription is not in arrear) forwarded by post to Members or delivered from the Society's Office to Members or to the bearer of their written order.

The back numbers of the Journal are kept constantly on sale by the publisher, Mr. JOHN MURRAY, 50A Albemarle Street, W.

NEW MEMBERS.—Every candidate for admission into the Society must be nominated by a Governor or Member, and must duly fill up and sign an application for Membership on the appointed form. Forms of Proposal may be obtained on application to the Secretary. The Secretary will inform new Members of their election by letter.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, JUNE 23, 1890.

LORD MORETON (PRESIDENT) IN THE CHAIR.

Present:—

Trustees.—Earl Cathcart, Mr. J. D. Dent, Col. Sir Nigel Kingscote, K.C.B., Duke of Richmond and Gordon, K.G., Sir Matthew White Ridley, Bart., M.P.

Vice-Presidents.—Earl of Feversham, Rt. Hon. Sir Massey Lopes, Bart., Sir J. H. Thorold, Bart.

Other Members of Council.—Mr. Percy E. Crutchley, Mr. Alfred Darby, Mr. Hugh Gerrings, Mr. A. Hamond, Mr. Charles Howard, Mr. C. S. Mainwaring, Mr. T. H. Miller, Hon. C. T. Parker, Mr. Albert Pell, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. S. Rowlandson, Mr. G. H. Sanday, Mr. A. J. Smith, Sir J. L. E. Spearman, Bart., Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. John Tremayne, Sir Jacob Wilson.

Professor Brown, C.B.

Mr. Ernest Clarke, Secretary and Editor.

The minutes of the Council held on June 4, and of the special meetings of the Council held in the Showyard on June 23 and 24, were read and confirmed.

The proceedings at the Special Councils included the sanction of the award of a Third Prize in Class I. of Farms, in the event of the Local Committee being willing to provide the funds, and various decisions on the subject of the entries of and prizes awarded to Jersey cattle.

VOL. I. T. S.—3

Election of New Governors and Members.

The election of the following Governor and twenty-four members was proceeded with:—

Governor.

BURTON, Lord..Bangmore, Burton-on-Trent.

Members.

BISHOP, E...10, Restormel Terrace, Plymouth.
BOSTON, Joseph...Broad Lane, Acob's Green, Birmingham.
BROWN, H. G...Kington Blount, Tewkesbury.
BROWN, Richard...Landport, Lewes.
BYASS, E. H...Wyke Hill, Stow-on-the-Wold.
DEAR, Francis...Lower Farm, Preston, Condover, Southampton.
DENNIS, Henry Dyke...New Hall, Ruabon.
DYKE, John...16 Water Street, Liverpool.
HARGREAVES, J. E...Beezor Lodge, Kendal.
HOMER, G. W...Aethelhampton Hall, Dorchester.
MILLYARD, J. W...Littlebridge, Bromyard.
NEWMAN, M. W...Empingham, Rutland.
PEARSON, A...Ramsdale Farm, Arnold, Notts.
RITSON, Archibald...Micklethwaite, Wigton.
RODD, E. S...Chardstock House, Chard.
RODWELL, W. H...Holbrook House, Ipswich.
RUDLAND, T. N...Woolverstone, Suffolk.
SCHACK-SOMMER, G...323 Vauxhall Road, Liverpool.
SHILL, R. D...30 Exchange St. East, Liverpool.
STRICKLAND, E...Othman Ho., Hailsham, Sussex.
TAYLOR, Charles, jun...Aldel House, Wooler, Northumberland.
THOMAS, G. P...Hemsworth, Wakefield.
TODD, D...Trinity Vicarage, Bingley, Yorks.
WALKER, J. W...Dalton Parva, Rotherham.

Finance.

Sir NIGEL KINGSCOTE (Chairman) presented for payment various accounts amounting in all to 2,052l. 4s. 6d., which had been duly passed by the Committee.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the wetness of the paint on some of the sheep hurdles had been discussed in the Committee, and that the Surveyor had been instructed to prepare estimates for sheep hurdles, after the pattern of the pig hurdles, for use at future Meetings. Mr. Bennison's statement of accounts had been examined and passed by the Committee, and they recommended that a cheque of 400*l.* be drawn in his favour for labour required during the forthcoming month.

Trials of Cider-Making Plant.

The following report, signed by Messrs. Dan. Pidgeon and F. J. Hayes, as Judges of Plant for Cider-making, and endorsed by the Stewards of Implements, was received:—

As the Judges appointed in Class IV., we have made a careful inspection of each of the exhibits in the yard, and find a great variety of machines, all of which are of considerable interest; but we find ourselves quite unable to form any conclusions as to the relative merits of the machines in question, without a trial of apples assisted by the dynamometer.

After discussion it was resolved, on the motion of Mr. DENT, seconded by Sir MATTHEW WHITE RIDLEY, that a further trial of these implements shall be made at some convenient place during next autumn, when the apples are in a condition for making the cider. [See p. cxv.]

Dates of Future Country Meetings.

The SECRETARY reported further correspondence with the Royal Counties Agricultural Society, as to the proposed deputation from that Society with reference to the dates of holding this Society's Annual Country Meetings, and it was arranged that a deputation of five or six representatives from that Society should be received on Wednesday, July 30 next, at 12.15 P.M.

Nomination of General Doncaster Committee.

On the motion of Sir JACOB WILSON, a General Doncaster Committee was appointed, to consist of the whole Council, together with six

representatives of the Local Committee to be nominated by the Mayor of Doncaster.

Votes of Thanks.

On the motion of Sir JACOB WILSON, votes of thanks for assistance rendered in connection with the Plymouth Meeting were unanimously passed to the Mayor and Corporation of Devonport; to Messrs. Harris Bulteel & Co., the local bankers of the Society; to the Chief Constables of the Devon, Plymouth, and Devonport Constabulary; to Messrs. Spooner & Co. for the furniture used in the offices; and to Mr. J. W. Billing for the floral decorations in the Showyard.

It was also resolved that at the close of the Meeting letters should be written conveying the appreciation of the Council of the very efficient services rendered by—1. The Detachment of the A Division of Metropolitan Police, under the command of Chief Inspector Wren; 2. the Officials of the St. John Ambulance Association in charge of the Ambulance Station; and 3. the Officials of the Great Western and South Western Railway Companies for the facilities afforded by them.

Miscellaneous.

Communications were received—1, from the Correspondents for the Society's Premium Stallions, *Eclipse*, *Jack Tar*, and *Lancastrian*, reporting the details of service during the past season; 2, from the Organising Committee of the Imperial Institute transmitting a copy of the Constitution of the Permanent Governing Body, upon which it is proposed that the Royal Agricultural Society of England shall be represented by one member; 3, from Monsieur Henry de Vilmorin, thanking the Society for his election as an Honorary Member; 4, from the Hunters' Improvement Society as to their proposed award of gold medals to brood mares; and 5, from the Town Clerk of Warwick with reference to the Society's Country Meeting of 1892.

Date of Next Meeting.

The Council then adjourned until Wednesday, July 30, at 12 Hanover Square, at 12 noon.

WEDNESDAY, JULY 30, 1890.

THE EARL OF RAVENSWORTH (PRESIDENT) IN THE CHAIR

Present:—

Trustees.—Right Hon. Sir Thomas Dyke Acland, Bart., Earl Cathcart, Sir Nigel Kingscote, K.C.B., Earl of Powis.

Vice-Presidents.—Earl of Feversham, Earl of Lathom, Right Hon. Sir Massey Lopes, Bart., Sir J. H. Thorold, Bart., Mr. O. Whitehead.

Other Members of Council.—Mr. G. M. Allender, Mr. J. Bowen-Jones, Lord Brongham and Vaux, Mr. James A. Caird, Mr. Chandos-Pole-Gell, Earl of Coventry, Mr. Percy Crutchley, Mr. C. de L. Faunce de Laune, Viscount Emlyn, Mr. William Frankish, Mr. Hugh Gorrings, Mr. Charles Howard, Mr. C. S. Mainwaring, Mr. T. H. Miller, Mr. Albert Pell, Mr. James Rawlence, Mr. G. H. Sanday, Mr. W. T. Searth, Mr. A. J. Smith, Mr. Henry Smith, Mr. Garrett Taylor, Mr. Jos. P. Terry, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. O. W. Wilson, Sir Jacob Wilson.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Mr. E. W. Voelcker, Acting Consulting Chemist.

The following members of the Doncaster Local Committee were also present:—The Mayor of Doncaster, Mr. F. Bacon-Frank, Alderman Stockil, Mr. John White, Mr. G. T. Wood, Mr. G. B. C. Yarborough, and Mr. George Chaffer (Secretary).

The minutes of the last monthly meeting of the Council, held in the Showyard at Plymouth on the 25th June, and of the Special Councils held on the 26th and 27th June, were read and confirmed.

The minutes of the Special Councils recorded various decisions upon points of detail connected with the Plymouth Show, and suggestions made by the Stewards of Stock which were referred to the Stock Prizes Committee for consideration.

Extension of leave to Consulting Chemist.

The PRESIDENT said that, as a matter of urgency, he must ask the permission of the Council to allow him to interpose before the ordinary business commenced, in order to read a telegram which had been received at the India Office from the Government of India, asking that the Society's consent might be obtained to an extension for a further period of two months of the year's leave of absence which the Council had granted to their Consulting Chemist, Dr. Voelcker. Dr. Voelcker, as they were aware, was now engaged in India upon a Government inquiry, of great complexity and importance, as to the best course to be adopted for the improvement of Indian Agriculture by scientific means. The Indian Government, to whom the Society had lent the services of Dr. Voelcker at the instance of Sir James Caird, telegraphed that they were anxious that he should complete his report before his departure, and they proposed that he should leave for England by the first steamer in January, which would enable him to attend the Society's Council meeting to be held in February. He thought the Council would probably be willing to accede to the application, and to extend Dr. Voelcker's leave of absence until the end of January next.

Viscount EMLYN said that the Chemical Committee had not had an opportunity of considering this application, as it was received after their sitting yesterday, but he thought he might venture to say in their name that they would raise no objection to the extension of Dr. Voelcker's leave of absence, and he hoped the Council would accede to it, as the work of the laboratory was being carried on entirely to the satisfaction of the Committee by the Acting Chemist.

It was then unanimously resolved to extend Dr. Voelcker's leave of absence until the 31st January 1891.

Election of Governors and Members.

The election of the following Governor and fifty-four Members was then proceeded with:—

Governor.

FREAKE, Sir Thomas G... Warfleet, Dartmouth.

Members.

ALEXANDER, F... 41 Eccleston Square, S.W.
AUCKLAND, Lord... Edenthorpe, Doncaster.
BAIN, D. W... Glenfendon, Portreath, Cornwall.
BERG, Count F... Sagnitz, by Riga, Russia.
COUSINS, W. W... The Gattens, Cliffe-at-Hoo, Kent.
CROSS, William... Red Scar, Preston.
CRUFT, Charles... 325 Holloway Road, N.
DANBY, Captain John... South Villa, Foggy Furze, West Hartlepool.
DICKINSON, R... Meersbrook Bank, Sheffield.
DOYLE, J. A... Withdean Farm, Pateham.
EASTLEY, T. B... Uplands, Paignton, Devon.
ELDER, A. L... Craigburn, Rindmarsh, South Australia.
FOWLER, R. S... Barton, Ch., Cornwall, Malvern.
FOWLER, R. H... Stone, South Works, Leeds.
FOX, C. J... Moulton, Lincolnshire.
FOX, Rev. H. H... South Selby, Durham.
FRANKS, J... Brigg, Lincolnshire.
GREENSHIELD, R. L... Rastham, Cheshire.
HARRISON, Major-General Sir Richard, K.C.B., R.N., Government House, Devonport.
HYDE, Rev. J. T... Roan Lanihorne, Grampound Road, Cornwall.
JOHN, R. B... 30, Princess Square, Plymouth.
LAMBERT, H. C. M... Sandhills, Bletchingley.
LAFFS, R... Sherbeck, Boston.
LANTON, W... Treldunderrow, Newlyn East, Cornwall.
LUMLEY, Percy... Selby, Yorkshire.
PARRINGTON, H. M... Imperial Hotel, Hall.
PETER, R. A. J. P... Plymarrven, Love, Cornwall.
RATRAY, J. T... Kilmorna, Listowel, co. Kerry.
ROBERTS, T... Wadworth Grange, Doncaster.
RYCROFT, R. N... Kempshott Park, Basingstoke.
SALTER, W. H... The Hall, Alderborough.
SCOTT, R... Glen Allen, Ainslie.
SKIDLEY, H. J... Wimborne, Dorset.
SHEPHERD, H. A... Shaw End, Kendal.
SMITH, F. A... Rasthorpe Ho, Ruddington, Notts.
SOLTAU, V. H... Little Efford, Plymouth.
SOBABIEZ, Khan Bahadur Bazenjee... Commissariat Department, Bombay, India.
STURGEON, C... South Ockenden, Romford.
TALFER, J. S. G... The Woollaw, Rochester, Otterburn, Northumberland.
TOOTH, R. L... 1, Queen's Gate, S.W.
TOWNSEND, C. E... Mount Coote, Kilmallock, co. Limerick.
TYLER, Edward... B. A. College, Cirencester.
UNITE, James G... 5, Malda Vale, W.
UNWIN, W. C., F.R.S... 7, Palace Gate Mansions.
VELVIN, W... Upton Farm, Ermington, Ivy-bridge, Devon.
VENDRELL, Señor Don Adolfo... Guatemala, South America.
WAIDE, R... 7, South Brook Street, Leeds.
WEBB, J... St. Grove Farm, Ottersham, Chertsey.

WEBB, S. G... Plymouth, Broughton Drive, Cressington, Liverpool.
WILLIAMS, H. H... Pencalenick, Truro.
WILLIAMS, J... Regilbury Park, Winford, Bristol.
WILLIAMS, P. D... Scorrier, Cornwall.
WILSON, W. E. S... Friars Hall, Hadleigh.
WIRE, W... Woolston House, N. Cadbury, Bath.
WOLFE, Miss E. S... Jarvis Brook, Tunbridge Wells.

The reports of the General Doncaster Committee and of the several Standing Committees were then presented and adopted as below:—

General Doncaster Committee.

In view of the fact that a deputation from the Royal Counties Agricultural Society was in attendance to make representations as to the dates of holding the Country Meetings of the Society, it was resolved that the report of the General Doncaster Committee should be read first, but that its adoption should not be discussed until after the deputation had stated their case.

Sir JOHN THOROLD then reported that the Committee had been constituted at the meeting of the Council held on June 25th, and was to consist of the whole Council, with six members of the Local Committee to be nominated by the Mayor of Doncaster. The following gentlemen had been nominated by the Mayor as local representatives, and had all been present at the meeting of the Committee held that morning:—The Mayor of Doncaster, Mr. G. B. C. Yarborough (President of the Doncaster Agricultural Society), Mr. F. Bacon-Frank, Alderman Stockil, Mr. John White, Mr. G. T. Wood, and Mr. George Chafer (Local Secretary). The Committee had considered the date to be suggested for the holding of the Doncaster Meeting, and had unanimously resolved to recommend, on the motion of the Mayor of Doncaster, seconded by Mr. Sanday, that the Show be held from Monday, June 22nd, to Friday, June 26th, 1891, the Implement Yard being open on the previous Saturday. The Mayor of Doncaster having announced that the Local Committee would be willing to offer £300 in prizes for farms situated in Yorkshire, the Committee recommended that these prizes be accepted, and that the conditions be

* Reinstated under Bye-law 12.

as below: the entries to close on Saturday, November 1st next:—

Farm Prizes in connection with Doncaster Meeting.

Class 1.—For the best managed Arable and Grass Farm of 200 acres and upwards, of which not less than one-half shall be arable. First Prize, £50; Second, £30; Third, £20.

Class 2.—For the best managed Arable and Grass Farm above 100 acres and not exceeding 200 acres, of which not less than one-half shall be arable. First Prize, £50; Second, £30; Third, £20.

Class 3.—For the best managed Arable and Grass Farm above forty acres and not exceeding 100 acres. First Prize, £50; Second, £30; Third, £20.

CONDITIONS OF ENTRY.

1.—The competition in all three classes is limited to tenant-farmers paying a *bonâ fide* rent for at least three-fourths of the land in their occupation.

2.—In assessing the proportion of arable and grass land on the occupation, the Judges are instructed to consider as permanent pasture all land that has been laid down to pasture for ten years.

3.—Competitors must enter for competition all the land in their occupation in the district.

4.—Competitors must have had the land in their occupation for not less than two years.

5.—The last day of entry is Saturday, November 1st, 1890. The entrance fee is £1 to members of the Society, and £2 to non-members. Members of the Doncaster Agricultural Society will be allowed to enter on the same terms as members of the Royal Agricultural Society.

6.—Competitors are requested to send a tracing of the plan of their farms with their certificate of entry, and to have ready for the Judges on their first visit a correct list of the stock on their farms.

7.—The Judges are instructed to take into consideration cases in which competitors occupy land when agents for their landlords, and are likely to derive undue advantage from that dual position.

8.—The Judges will be instructed to withhold the prizes in the absence of sufficient merit in any of the competing farms.

9.—The Judges will be instructed especially to consider:—

1. General management with a view to profit.
2. Productiveness of crops.
3. Quality and suitability of live stock, especially that bred upon the farm.
4. Management of grass land.
5. State of gates, fences, roads, and general neatness.
6. Mode of book-keeping followed (if any).
7. Management of the dairy and dairy produce, if dairying is pursued.
8. The duration of the tenancy.

10.—The Judges are authorised to recommend to the Council the award of certificates to any really deserving persons employed on any of the competing farms for distinguished merit in the discharge of their duties, such recommendations to be accompanied by a certificate of good character and length of service from the competing farmer. The number of certificates so granted may not exceed three in the case of a farm entered in class 1, two in the case of class 2, and one in class 3.

Deputation from Royal Counties Agricultural Society.

A deputation was then received from the Royal Counties Agricultural Society with reference to the dates of holding the Country Meetings of the Royal Agricultural Society.

The Earl of NORTHBROOK, as President of the Royal Counties Society, introduced the deputation, which consisted of the Duke of Wellington, Lord Basing, and Messrs. Dymore Brown (Chairman of the Committee of the Society), W. J. Henman, W. Mousley, W. Newton, the Secretary (Mr. Charles Simmons), and the Assistant Secretary (Mr. C. Franklin Simmons). His Lordship said that the Council were fully aware of the object of the deputation. The Royal Counties Society thought they had a grievance against the Royal Agricultural Society.

tural Society, in consequence of the change of date and time of their Meetings. Lord Basing, who had been so very long connected with the Society, would kindly state their case.

LORD BASING said that the matter, though not perhaps one of life and death, was yet to them a very serious one, in which they took the deepest interest, and which was most important for their future success. Their Society had been in existence for a great number of years. Beginning in a small way, they had within the last few years grown very considerably, comparing with the Bath and West of England, and covering the two counties of Hants and Berks, each county containing a Royal residence; and Her Majesty the Queen was a patron and subscriber. For twenty-five years they had continued in uninterrupted success, and particularly for the last moiety of that period. There was no interruption to the continuous improvement in their numbers, in their exhibitions, and in the credit which they got from the press and the public, until the unfortunate year when, on the occasion of the jubilee of the "Royal" Society, that Society changed the habitual period of their meetings from the early part of July to the third week in June. This week had been the meeting-time of the Royal Counties from the first, and no interruption had occurred and no difficulty had been felt. In their experience they found that week to be the most convenient time until two years ago, when the "Royal" met at Windsor, in the district of the Royal Counties, on the occasion of their jubilee. The consequences of that were disastrous to the Meeting which the Royal Counties held the same year at Horsham. To their surprise, the "Royal" Society, having changed the period of their Meeting from July to June in that year, continued the same course in the year which followed, viz., this year at Plymouth, and the results to the Royal Counties were also very disastrous. He attributed their losses in these two years to the fact that they followed instead of preceded the Meeting of the "Royal" Society. It was known that the breeders of stock and the exhibitors of imple-

ments, whose assistance they desired to have, looked to the "Royal" as the culmination—the acme of the agricultural year. Many exhibitors withdrew from competition after that date, and, especially, the foreigners went away as soon as the "Royal" had held its Show. He appealed to that most representative meeting of the "Royal" Council to decide this question, not exclusively on the point of personal convenience of any of the leading members of the Council, but to decide it in the interest of the agricultural community of the whole kingdom. It might be that the "Royal" Society would desire to absorb within itself all the duties and all the functions which appertained to smaller societies, but he hardly thought that that would be found to be the case, but that they would take a large and liberal view of their position, and feel that they were responsible in a way for agricultural shows of all kinds, which, as they knew, had been conducted with constantly growing success. It would be a calamity if the Royal Counties or the Bath and West were hindered in the further success of what had hitherto been a prosperous career. To show some of the points which he had indicated, he might mention that previous to the year 1889 the Meetings of the Royal Counties Society were uniformly held in the third week in June. There was only one show during the whole of that period which resulted in a loss, and that was in the year when the Queen's Jubilee took place, with which of course the Society had nothing to do. Each of the shows since the change of date had resulted in a considerable loss. During the last two years, when the "Royal" had held its show in the third week of June instead of in July, as had been customary for fifty years, the gate money for the Royal Counties Show had seriously fallen off, being 30 per cent. below the average of the six previous years. But a point interesting to agriculturists was that the number of absent exhibits in the stock classes had largely increased since the change of date. The number of entries which had been received, but which on the opening day of the show held in 1889 were

found wanting, were four times as many as in 1888, while at the Winchester Show this year the absent exhibits exceeded by eighty-eight those of last year's show. Exhibitors would not incur the expense of sending to the Royal Counties Show after they had been beaten at the "Royal." They had the same difficulty in regard to the implement exhibitors. Since the date had been changed the number had fallen considerably, the average of implement exhibitors during the last two years being 50 per cent. below the average of the five preceding years. Foreign buyers did not attend the Royal Counties Show because they went home immediately after the "Royal" Show. He earnestly hoped that the members of the Council would consider whether—in consequence of the Royal Counties having to hold their Meeting at the time named—the period of the year would not have very serious and prejudicial effects upon the fortunes of a very much smaller, less important, but certainly thriving Society, and whether they could not prevent this by reverting to the older period for their annual Country Meeting.

No other members of the deputation desiring to offer any observations,

The **PRESIDENT** said it was his duty, on behalf of the Council, to thank them for coming there that day to explain the reasons of the change which they suggested. He could assure them that the statement so clearly made by Lord Basing would be most carefully considered by the Council. It would not be in accordance with his duty or the convenience of the Council that he should attempt hastily to give an answer to the important points brought forward. There was, however, one matter to which he would like to take an exception. He could assure his friend Lord Basing, an old Parliamentary colleague of his own, that there was no desire on the part of the "Royal" Society to "absorb" the duties of other, not rival, but local societies. In proof of that he would point to the effect of the operations of that great Society in the success with which county shows were held all over the kingdom. The Council thanked them very much

for their attendance, and their answer would be conveyed in writing to the Royal Counties Society.

The deputation then withdrew, and the President declared the question open to discussion.

The Mayor of **DONCASTER** (Mr. Joseph Firth Clark), on behalf of the Local Committee, stated that there were reasons which made it exceedingly important that the date of Meeting should not be changed from the third week in June.

The Earl of **FEVERSHAM** suggested that perhaps Sir Jacob Wilson, or some one who had had long experience in the affairs of the Society, would state the peculiar advantages which were supposed to exist in the change from the former date to the present. He had no doubt that there were excellent reasons for the change, but he should like to know what the reasons were for continuing the changed date.

Sir **JACOB WILSON** said unfortunately he was not present at the meeting of the General Doncaster Committee when the matter was discussed that morning, but he had been very carefully into the matter with the Secretary and others, and they had come to the decision that the week commencing June 22nd was certainly the right week for the Doncaster Show, and that this period of the year was generally most suitable for their Meeting. The farmers of England had come to the conclusion that this was the best week for their purpose, not only on the ground that it suited holiday-makers, but because it was a most convenient week with reference to the hay harvest and other operations of the farm, and the animals were best fitted for showing at that time. There were other considerations which might be mentioned, but he thought he need not point to anything more than the weather which they had had during the last two years. Their experience of the weather during the present season, and certainly during the Windsor Show, showed that they had selected the right week. The Council did not of course wish to offend the susceptibilities of any other Society, but really he must demur to the interests of this large national Society

being sacrificed to those of much smaller and more local societies: which, whilst undoubtedly doing good service in their respective spheres, could hardly claim a monopoly of a week which had been proved most convenient to the general body of agriculturists throughout the country, whom it was the object and the function of the "Royal" to serve. The arguments of the deputation were not in his opinion sound, because from his own personal experience nine-tenths of the shows of the United Kingdom took place after the "Royal," and successfully. The President was connected with some large and important societies which had held exceedingly successful shows within the last week. As his friend Mr. Garrett Taylor reminded him, the Royal Counties was not the only Society interfered with by the change of the date. The Norfolk Agricultural Society found themselves similarly situated, but they took the philosophical measure of adopting the week of the "Royal." He believed they had no reason to complain, but had held a very successful Show at Yarmouth. That proved that it was not necessary that the county shows should culminate with the "Royal." He pointed to the fact that 700 or 800 horses were going to be exhibited at the Yorkshire Show at Harrogate next week. That showed that the interest was still being kept up. Then there was the Show of the Highland Society going on that day at Dundee. Their friends must not forget that both last year and this year the Royal Show was held in a district which was supposed to belong to the Southern Counties. Whether the Royal Counties Show were held at Horsham or at Winchester, it was equally likely to be injuriously affected in this way. But next year when the "Royal" went to Doncaster, they would not feel the same ill effects. All things considered, and after an experience of more than twenty-five years in connection with that Society, he could not help feeling that the Council had adopted the right principle in holding the Show during the third week in June.

Mr. GARRETT TAYLOR, as a representative of the county of Norfolk, said that their Society was in exactly

the same position in regard to the date of the Show. The "Royal" had taken their week, and they, therefore, simply bowed to the decision of the larger Society, and took the week of the "Royal." Their experience of the change in the Show held at Yarmouth had been most successful, both in regard to the entries of stock and the entry of the public, so much so that they had taken £1,100 in gate money.

After some further conversation the recommendation of the General Doncaster Committee, that the date of the Doncaster Meeting be fixed for Monday, June 22nd, to Friday, June 26th, was put to the vote and unanimously adopted.

At the request of the Council, the PRESIDENT undertook to inform Lord Northbrook, as President of the Royal Counties Agricultural Society, that the Council had unanimously come to the conclusion that no sufficient reasons had been adduced for altering the period of the year, which the Council, after many years' experience, and with the approval of the great body of their members and exhibitors, had recently fixed upon for the holding of their annual Country Meeting.

Finance.

Sir NIGEL KINGSFOTE (Chairman) reported that the accounts, as certified by the Society's accountants, for the month of June, and also for the period ended 26th July, had been laid upon the table and approved. The receipts for June were 2,334*l.* 1*s.* 6*d.*, and the expenditure was 4,942*l.* 10*s.* 10*d.*, and for the period ended the 26th July the receipts were 2,102*l.* 16*s.* 6*d.*, and the expenditure was 1,532*l.* 18*s.* 4*d.*. The balance at the bank, allowing for cheques outstanding, was 3,420*l.* 18*s.* 3*d.* on the 30th June, and 3,990*l.* 16*s.* 5*d.* on the 26th July. Accounts relating to the Plymouth Meeting, amounting to 10,344*l.* 1*s.* 5*d.*, and relating to the ordinary business of the Society, amounting to 2,447*l.* 16*s.* 1*d.*, had been passed, and were recommended for payment. The quarterly statement of arrears and property had been submitted and approved. The Committee recommended that the names of forty-five life and thirty-three annual members who were deceased, of six members who had resigned, one without

address, and twenty-three in arrears (108 in all), be struck off the Society's books: also that two members be reinstated under Bye-law 12.

In presenting this report, Sir NIGEL KINGSCOTE observed that the Council would notice that a somewhat considerable number of deaths, especially of life members, were recorded by the Finance Committee that day. The large number of life members arose from the operation of the Bye-law (5) which required life members to give receipts for the Journal at periodical intervals as required by the Council. The Committee thought the issue of the first number of the new quarterly Journal a convenient opportunity for putting this requirement into force; and although there had been a few complaints from life members on the subject, the Council might, he thought, regard themselves as amply justified in asking life members to give the same evidence of their continued existence as the receipt of the annual subscription afforded in the case of ordinary members, when they found that in three months the deaths of more than seventy members had come to light, which probably would otherwise have remained undiscovered by the Society for some considerable time. The representatives of deceased members received and accepted, no doubt unthinkingly, Journals, tickets for the Shows, and other communications from the Society which were of course personal to the deceased member, and to which no one else could possibly be entitled. At the meetings of Council held on May 7th and June 4th, a total of fifty life members were reported as being dead, and of these thirty-one were notified in response to the circular sent out with the Journal in April last. One member still on the books was found to have been dead ten years, and another "many years," the remainder falling into the average of from one to two years. Out of forty-five life members whose deaths were reported by the Finance Committee that day, no less than forty were brought to light by means of a second circular sent out with the programme for the Plymouth Meeting to those life members who had not answered the circular of April. Of these, one member had

been dead seven years, and a large proportion from one to two years; while a few of the circulars had been returned through the Post Office endorsed "Addressee deceased." A considerable number of life members still remained who had answered neither the first nor the second circular. As the proportion of deaths notified was less than 1 per cent. after the first circular, and was five per cent. after the second circular, it was only reasonable to suppose that an appreciable number of deaths still remained to be notified amongst the members from whom no receipts had yet been received. These cases would be dealt with during the autumn. An incidental advantage of great importance had been gained through the issue of the forms of receipt, as an enormous number of alterations in, and changes of, addresses had been notified to the Society, which could not fail to facilitate the safe and speedy delivery to members of subsequent numbers of the Journal.

Sir NIGEL KINGSCOTE then moved, and it was unanimously resolved:—

That in view of the desirableness of winding up the accounts of the Plymouth Meeting as early as possible, authority be given to the President, the Chairman of the Finance Committee, and the Secretary, to issue during the recess orders on the Society's Bankers for the payment of accounts connected with the Meeting, such accounts to have been previously submitted to and passed by a Steward of Finance.

House.

Sir NIGEL KINGSCOTE (Chairman) reported that the new bookcase ordered had been erected during the absence of the staff at Plymouth. Certain works of drainage had become necessary in the house, and an account for such works was presented for payment. Sanction had been given for various new articles to be purchased for the house in place of others worn out.

Journal.

Earl CATHCART (Chairman) reported that the second number of the new series of the Journal, and the index to the second series, had been

published on the 30th June and had been issued immediately to the members. A list had been received from the Judges of farms at Plymouth of persons engaged on the competing farms, who were recommended by the competitors for the Society's certificates, in recognition of distinguished merit and length of service. The Committee recommended that certificates be granted to the following persons, accompanied by a gratuity of £1 in each case:—

Mr. Vosper's Farm:—George and Ann Maddock, James and Elizabeth Avery, Henry Gabriel, William Hemphill, John and Eliza Ellis, John Duckham.

Mr. Lawry's Farm:—William Youlton, Stephen Spear.

Mr. Ford, Sen.'s, Farm:—Samuel Freeman, Samuel Hurrell.

Mr. Franklin's Farm:—Thomas Cowley, James Grant, John Grant.

The Editor had submitted his arrangements, as at present proposed, for the next number of the Journal. These had been considered and approved. Various suggestions for papers in the Journal had been discussed, and instructions thereon given to the Editor. Authority was given to extend to public libraries and similar institutions the same facilities for the purchase of back numbers of the Journal as were accorded to members of the Society.

Earl CATHCART wished to draw the particular attention of the Veterinary Committee to the subject of foot-rot in sheep, in reference to a paper submitted for the Journal on the contagious character of that disease. There was a very strong opinion amongst practical men that the disease was contagious, but in that opinion they did not carry with them the veterinary profession. He believed that this idea was not altogether orthodox; but he thought the matter ought to be inquired into and set at rest. He understood that the Royal Veterinary College had just acquired magnificent microscopical and other apparatus for bacteriological research, and they would have no difficulty in finding sheep affected with foot-rot for the purposes of experiments.

Sir JOHN THOROLD observed that in the case in question the sheep sent

to the Royal Veterinary College as animals which would develop foot-rot had remained perfectly sound.

Mr. BOWEN-JONES said that this was a subject of the very greatest importance, and although he, during all his life, had taken a different view to that expressed, he had forwarded the paper for the consideration of the Journal Committee, knowing the writer to be a thoroughly practical man of careful judgment. He thought it most important that investigation should be made in the direction suggested.

Mr. RAWLENCE said he had had as many as 10,000 sheep under his care, and had suffered some years ago frightful losses from this disease, but he had hardly any sheep now suffering from it. A great deal depended upon the shepherd and the supervision which the master gave to see that the sheep were properly looked after and their feet properly pared. He had adopted the Australian plan of running them about twice or three times a week through a shallow tank, something like a brewer's vat. By this means he had entirely eradicated the disease, and he thought that with proper attention they could put a stop to the disease themselves.

Mr. DE LAUNE quoted the opinion of Professor AXE that the disease was neither contagious nor infectious; but still, his own experiments always pointed to the fact that the sheep did catch it one from another. They had only to put a foot-rot sheep amongst a hundred sound ones, and after a few weeks many of them would have the disease. He thought it would be a very good thing that the Society should institute investigations under practical and scientific men combined, so that they might find out what was the cause of this disease which had done so much harm. He had himself spent six weeks in dressing sheep's feet, so that he had had some experience in the matter.

Mr. HOWARD would be glad if an investigation into this terrible disease were undertaken. He knew no disease from which sheep breeders had suffered so much. The remedy suggested might do very well for his friend Mr. Rawlence, who perhaps lived upon chalk soil, where foot-rot was not so

prevalent as it was upon the damp soils of the country. He thought that veterinary science was not up to the times in regard to this disease—in fact, that the profession had shirked it. He was sorry to find that this disease was not touched upon by Professor Brown in his pamphlet on the “Animals of the Farm.”

Earl CATHCART said it might be possible to stamp out the disease for a time; but if they went to the market and bought a few fresh sheep, the disease broke out again before the sheep had been there a month.

The subject then dropped, but it was understood that it would receive the attention of the Veterinary Committee.

Chemical.

Viscount EMLYN (Chairman) submitted a letter from Mr. Hermann Voss, the President of the Chemical Manure Manufacturers' Association, stating that at a general meeting of the Association held at Plymouth during the Show a resolution had been passed:—“That this meeting is of opinion it is desirable in the interests of the trade that for the future the percentage of soluble phosphates guaranteed shall be branded on each bag sold for the home trade in a conspicuous place.” The Association, having heard of low grades of superphosphate being sold without sufficient intimation as to quality, considered it in the interests of consumers and manufacturers alike to avoid any misunderstanding by agreeing to distinctly brand the guaranteed minimum of soluble phosphates on the bags, and the President of the Association wrote that he thought that no doubt this resolution would be received with satisfaction by the Society, and that they would advise their members to see that for the future all bags containing superphosphate purchased by them were branded in the manner agreed upon. The Committee recommended that Mr. Voss be informed in reply that the Society recognises with satisfaction all efforts made by the trade to prevent the improper sale of inferior low quality manures.

The Committee then presented their Quarterly Report, which, on the motion of Viscount EMLYN, was ordered to be published with the pro-

ceedings of Council, and in the next number of the Journal (see page 636).

Seeds and Plant Diseases.

Mr. WHITEHEAD (Chairman) said that Miss Ormerod, who was unfortunately absent through illness, had forwarded a report on the Hessian Fly, which the Committee recommended should be published in the proceedings of the Council (see below). Mr. Carruthers had reported that he had communicated with the Council in reference to the proposed pasture experiments, and that twenty-one members of the Council had reported the existence in their neighbourhoods of old pastures of high feeding qualities, representing fifty pastures. The Committee recommended that these should be visited by the Consulting Botanist in pursuance of his inquiry.

The Committee suggested the following schedule of prizes for Jams and Cider in connection with the Doncaster Meeting of 1891:—

JAMS AND PRESERVED FRUITS.

[To be prepared exclusively from fruits grown in the United Kingdom in the year 1890.]

	£	s	d
1. Collection of whole fruit Jams	5	5	0
2. Collection of bottled fruits	5	5	0
3. Collection of preserved fruits for dessert purposes	5	5	0
4. Collection of dried or evaporated fruits for cooking purposes	5	5	0

CIDER AND PERRY.

[The exhibitors to certify that the Cider or Perry was prepared by themselves from fruit grown by themselves in 1890.]

	£	s	d
1. Cask of not less than 18 and not more than 30 gallons of Cider made in the autumn of 1890	5	5	0
2. One dozen bottles of Cider made in the autumn of 1890	5	5	0
3. One dozen bottles of Cider made in any year before 1890	5	5	0
4. One dozen bottles of Perry	5	5	0

Consulting Entomologist's Report.

Up to Monday, the 21st inst., I had no definite report of presence of Hessian fly having been again observed this summer, but on that day I received information from Professor Harker, of the Royal Agricultural College, Cirencester, that

Hessian fly was numerous in that neighbourhood, and I therefore wrote to a few other observers (whom I knew to be also well acquainted with the attack) to inquire whether the infestation had been noticed at various localities at a considerable distance from each other.

Mr. J. Eardley Mason, writing in reply from Alford, on the eastern side of Lincolnshire, mentioned that he had found Hessian fly both as larvæ and puparia—that is to say, both in the maggot and what is commonly known as the “flax seed” state—in every field that he had examined, but sparingly.

Mr. G. E. Palmer, of Revells’ Hall, Hertford (the first observer of this attack in England), wrote me that on receiving my letter he made a careful examination of the wheat and barley crops, with the following result:—

Barley.—Damage from the Hessian fly slight, a few stalks here and there being broken down, and containing the puparia.

Wheat.—No perceptible damage, although there is occasionally a stalk attacked and broken down.

There appeared on the whole to be very little injury caused by Hessian fly in the observer’s neighbourhood, whether to wheat or barley, but as the heavy rains had laid the straw it would not be possible, until this has passed through the threshing machine, to tell the amount of infestation that may be present.

Mr. S. L. Mosley, Beaumont Museum, Huddersfield, informed me that he had looked for the attack in the neighbouring part of Yorkshire this season, but had not found it, nor had any of his entomological or other correspondents mentioned to him the presence of Hessian fly in other parts of the country.

I have not myself had communication from Grantham as to the attack which was reported in that neighbourhood, but as Mr. Whitehead (Chairman of Seeds and Plant Diseases Committee) has himself seen specimens of puparia, of which he forwarded me a sample,

the infestation is obviously to be found there; but at present there is not any report of general prevalence of the attack.

ELEANOR A. ORMEROD,
July 28th, 1890.

Veterinary.

Sir JOHN THOROLD (Chairman) stated that Professor Brown had presented the following report:—

PLEURO-PNEUMONIA.—This disease has recently increased in Great Britain, more particularly in England. In the seven weeks from 1st June to 19th July, 124 fresh outbreaks of pleuro-pneumonia were reported, ninety-six in England and twenty-eight in Scotland. The recent outbreaks have occurred in the counties of Chester, Cumberland, Essex, Kent, Lancaster, Leicester, Middlesex, Northumberland, Surrey, York (West Riding), Aberdeen, Edinburgh, Fife, Lanark, and Renfrew.

The total number of cattle found affected with the disease was 422, of which 314 were in England, and 108 in Scotland; in addition to these, 1,777 healthy cattle which had been exposed to the risk of infection were slaughtered; 1,316 of these were in England, and 461 in Scotland.

In Ireland there were thirteen fresh outbreaks reported in the seven weeks, thirty-two cattle were found affected, and 486 healthy cattle in contact with the diseased animals were slaughtered.

ANTHRAX.—Between 1st June and 19th July twelve outbreaks of anthrax were reported in Great Britain, eleven of them in England, and one in Scotland. These outbreaks occurred in the following counties, and on the following dates:—Bucks, Beaconsfield district, June 13th; Cumberland, near Carlisle, July 18th; Dorset, Cerne Abbas district, June 4th and 25th, and July 3rd; Kent, near Bromley, June 17th; Lincoln (Lindsey), June 5th and 22nd; Notts, near Newark, June 9th; Stafford, Shenstone, June 18th; Suffolk, Cosford, June 26th. The outbreak in Scotland occurred near Nairn, on June 3rd. In these outbreaks fifty-four animals were

attacked, three diseased animals were killed, twenty-four died, and twenty-seven recovered.

In Ireland only two outbreaks of anthrax were reported, and two animals attacked.

SWINE FEVER.—Of this disease 1,009 fresh outbreaks occurred in Great Britain in the period above-mentioned; 5,182 swine were attacked, 2,189 diseased pigs were killed, 2,186 died, 537 recovered and 760 remained alive when the return was made up. In Ireland eighty-five outbreaks of swine fever were reported, and 256 animals were attacked.

RABIES.—In England eighteen cases of this disease were reported in the counties of Bucks, Derby, Lancaster, London, Middlesex, Norfolk, Northampton, Stafford, Warwick, and York (West Riding). In Ireland rabies is much more prevalent, and more widely distributed than in England, there having been eighty-six cases reported in nineteen different counties in the seven weeks.

In connection with the department of research in Comparative Pathology established under a grant from the Royal Agricultural Society, the necessary apparatus for the equipment of the laboratory at the Royal Veterinary College, *i.e.* microscopes, camera, &c., are ready for use, and Mr. Coghill has commenced his work. Mr. Bland Sutton has consented to give a course of lectures on Comparative Pathology, and Professor Crookshank will undertake the lectures and demonstrations on Bacteriology during the session which will commence next October.

With reference to the letter from the Board of Agriculture on the subject of pleuro-pneumonia, which was about to be considered by the Council, the Committee recommended that in addition to any other steps which might be deemed desirable, each of the Society's Provincial Veterinary Surgeons be instructed to immediately inform the Secretary of the Society by telegraph of any outbreak of pleuro-pneumonia occurring within his district or otherwise coming under

his cognisance, such action to be independent of any duties which he might have to fulfil as an inspector of the local authority or of the Board of Agriculture. They recommended that the cost of telegraphing should be defrayed by the Society, and that the telegrams when received should be immediately forwarded, by the Secretary, to the Board of Agriculture. A report had been received from Professor Brown certifying that none of the animals exhibited at the Plymouth Meeting were affected with any contagious disease, and that no outbreak of infectious disease had occurred during the Show. A letter had been received from Mr. Owen Thomas, of Tycoch, Llanerchymedd, accepting the appointment of Provincial Veterinary Surgeon for the county of Anglesey. The question of the continuance of the Society's horse-shoeing competitions had been discussed, and it had been agreed that it would be undesirable to discontinue them for the present, until a competition had taken place in each of the Society's districts, or until the Registration Scheme of the Farriers' Company was in full working order.

Pleuro-pneumonia Act, 1890.

The PRESIDENT said that it would be convenient, before the report of the Veterinary Committee was adopted, that the letter addressed to him on the 16th instant by the Board of Agriculture, on the subject of the Pleuro-pneumonia Act of this Session, should be read and discussed.

The SECRETARY then read the following letter:—

Board of Agriculture,
2, St. James's Square, London, S.W.:
July 16th, 1890.

My Lord,—I am directed by the President to call your attention to the Act of Parliament (53 & 54 Vict. c. 14), which has recently received the Royal Assent, for conferring on the Board of Agriculture further powers for dealing with pleuro-pneumonia in cattle.

You will observe that it provides for the slaughter of cattle by the Board, and for the payment of compensation out of Imperial

funds. It comes into operation on the 1st September next, and it is needless to point out that the success of the measure will greatly depend upon the cordial co-operation of the owners and breeders of stock, and of persons connected with the cattle trade throughout the country.

Pleuro-pneumonia can be arrested without difficulty when it is discovered; but in many cases its existence is easily concealed, and it is essential for the proper performance of their duties that the Board of Agriculture should receive in every case, as soon as it is known, prompt and certain information of the existence of the disease.

The high position of the Royal Agricultural Society of England, comprising amongst its members so many of the leading agriculturists of the kingdom, enables it to exercise an influence in agricultural circles which is second to that of no institution in the country.

I am directed to express the hope that in the execution of the task which is before them, the Board may receive your cordial support, and I am to say that for any assistance which your Society can render by the exercise of its influence in securing for the Board the earliest intimation of outbreaks of disease, the President will feel that he is greatly indebted.

I am, My Lord,

Your Lordship's obedient servant,
(Signed) C. HARRY TERNANT,
for Secretary.

The President,
Royal Agricultural Society of England,
12, Hanover Square, W.

Sir JACOB WILSON said it would be in their recollection that at the meeting of the Council held in November last a representation was made to the Government as to the great desirability of pushing forward legislation as soon as possible with regard to pleuro-pneumonia, in order to establish the principle of central in place of local action. As they were aware, legislation was not a very rapid process at the present time; but it was gratifying to find that at last, by

the assistance of both sides of the House, the Government Bill had passed all its stages and, having now received the assent of Her Majesty, had become an Act of Parliament. At the deputation which waited upon the Minister of Agriculture in February last, they strongly urged that it was most important to get this measure passed in time for effect to be given to it before the cattle went out of the yards, when the dealing with the disease was comparatively easy. That unfortunately could not be done, and the result—which was fully anticipated and confidently expected on the part of those most interested—was, that as soon as the movement began to take place in order to carry out the general economy of the farm at that particular time of year, the disease had spread far and wide. That was the cause of the increase of prevalence of the disease referred to in the report which Sir John Thorold had just read. This movement of cattle might be regarded as the general cause of the dissemination and spreading of disease. The special cause, however, was the fraudulent concealment of the existence of disease, not only on the part of owners of stock in the country, but more particularly—he was sorry to say—on the part of those who acted as the medium between the sellers and the purchasers. In support of this he need only point to what had taken place in the dairies of Edinburgh, and in the counties of Chester and Lancaster, to show how very widespread this dissemination of disease had been. What the remedy of this was to be he was not prepared to say, but his own opinion was that it rested very much with the magistracy of the country. The fines they had hitherto inflicted showed that they were not alive to the responsibility resting upon them, and the paltry nominal fines which had been imposed had no sort of deterrent effect upon the persons to whom he referred.

There was another point which very much required their attention, viz., the establishment of a system of registration on the part of those whose business it was to sell cattle throughout the country, so

that the central authority might be able to trace the disease to its origin, and track its subsequent developments. Such a suggestion had already been made by the auctioneers of the marts in the county of Northumberland, and he had reason to believe that it would be adopted in other parts of England. He would strongly urge members of Council in their respective districts to do all in their power to further such a system, which would be of infinite importance and assistance to the Government.

They were aware that one of the great reasons and justification for a central authority had been the success which had attended the central action in Holland; but they must bear in mind that in Holland the orders of the Government were most absolutely and implicitly obeyed by the farmers of that country. Now, it would be utterly hopeless, he felt, without the co-operation of the stockowners and agriculturists generally, to achieve their great object in getting rid of the disease. He strongly urged that some representation be made, not only to the veterinary officials of the Society, but also to the general body of their members. He had no doubt whatever that when the time came—after September 1, and especially after the cattle had been brought in once more from the fields—the disease would be dealt with in a very heroic manner by the central authority. Farmers and stockowners would probably have to submit to many inconveniences, such as the stoppage of fairs and markets in diseased districts, and some indirect loss would doubtless ensue.

He strongly urged the Council to maintain the position they had hitherto held—if he might make bold to say so—as the leaders of agricultural thought in the country, and to impress upon the 10,000 members of the Society the necessity of co-operating to the best of their ability in the endeavour now being made to get rid of the disease. With that object he had drawn up the following resolutions, which he now begged leave to move:—

1. That the Council having received a letter from the President of the Board of Agriculture re-

specting the Contagious Diseases (Animals) (Pleuro-pneumonia) Act, 1890, desires to afford to the Government the utmost possible assistance in carrying out the provisions of the Act.

2. With this view the Council begs to impress upon all members and officials of the Society the great importance of prompt declaration of disease whenever it may appear, and a loyal submission to the Orders which may from time to time be issued by the Board of Agriculture; and the Council further requests that they will use their influence to this effect in their respective localities.

3. That a copy of these resolutions be forwarded to the Board of Agriculture, together with a covering letter to be signed by the President, explanatory of the action which the Society proposes to take; and that a circular letter be addressed to all the members of the Society, requesting their co-operation in securing for the Board of Agriculture the earliest possible intimation of outbreaks of pleuro-pneumonia.

Sir JOHN THOROLD seconded, saying that the recommendation of the Veterinary Committee was the most that the Committee felt they could make as a Committee, though he entirely sympathised with the more general action proposed by Sir Jacob Wilson. There were very many cases in the country where the disease was concealed, and the Veterinary Committee thought it possible that the Society's Provincial Surgeons could obtain knowledge of the disease which the central authorities might not otherwise get. They suggested, therefore, that these gentlemen should be asked to telegraph to the Secretary of the Society any cases of disease coming under their notice, and that the Secretary should at once inform the Board of Agriculture. With regard to the resolution of Sir Jacob Wilson, he felt it was most important that they should have the general support of all the members of the Society in carrying out the recommendation of the Council.

Mr. GABRIEL TAYLOR supported the resolution. His county (Norfolk)

had been credited with having most of the disease. This was owing to the importation of Irish cattle. They found no difficulty whatever in getting all the information from the owners of cattle in the county as to the existence of disease. There was no desire for secrecy. The great difficulty they found in regard to the cattle which came into their market was in tracing where the disease came from. All the information they got was that the cattle were collected in Ireland and sent over here, but they could not trace where the cattle originally came from. He was afraid the difficulty was that in Ireland they were very interested in hiding the disease and not giving any information whatever. There would be a fearful loss, he was afraid, not so much to them as to the Government, unless some means could be found of tracing the cattle in Ireland.

Sir NIEL KINGSOORN also supported the resolution. He would only supplement the remarks of the last speaker by saying that there were delinquents not only in Ireland, but in England. He fully endorsed what Sir Jacob had stated, that to get hold of the unscrupulous middlemen was the great point. It would certainly tend to this object if dealers were licensed and registered, but he was afraid that, even with the co-operation of almost everybody interested in agriculture, until the concealment of disease was made criminal and not visited merely by a fine, they would not get to the bottom of it. The great difficulty was that these people did not care for fines, and embarked largely in dealing operations, knowing that the fine was of little account in their bargains. He hoped the Council and the members of the Society would give effect to Sir Jacob Wilson's resolution.

Mr. TERRY said that since the last meeting of the Council he had been speaking to a man largely interested in London cowsheds, who stated in reply to a question that, although he knew of the existence of the disease, he would not give information, in consequence of the injury to his trade. He said that he had to send milk to six or eight places where the

disease existed, in order that the milk-dealers might keep their contracts for the supply of milk to various institutions. The great difficulty was that they could not compensate a man when they took away his entire living. Another reason was that where a man had a diseased animal and called in a veterinary surgeon, the surgeon would say that the animal had lung disease, but he could not tell whether it was pleuro-pneumonia until the animal was killed. If after post-mortem examination the animal proved not to be suffering from pleuro-pneumonia, no compensation was paid. Owners did not like to run the risk in this way of getting no compensation at all.

The PRESIDENT said that, before putting the resolution, he would like to point out that this matter had been discussed at considerable length in the House of Lords, and Lord Spencer—a member of that Council—had done great public service in calling attention to the subject. He pointed out, as had been confirmed by the practical observations of Mr. Terry, that the most dangerous foci of the disease were undoubtedly the cattle sheds belonging to owners of milking cows in their large towns, and it was almost an impossible thing to expect that a man would voluntarily sacrifice his business in order to reveal the condition of his cows. As he had always urged, he thought that unless they could obtain by some means or other—and he was not very sanguine about it—the co-operation of the municipal authorities in the large towns, their efforts in the counties would be in vain. This must be worked, he need not remind them, through the Animals' Diseases Committees which existed in all the County Councils of the country. He would undertake, as a member of the County Council of Durham, where the demand for milk was enormous, and where men would do anything in the world rather than show up the fact that the disease existed in their cattle sheds, to impress it strongly upon his Committee, and by persuasion or other means to enlist the sympathy of the municipal authorities in the towns,

where this matter was much more important than in the rural districts, because there they had their own farmers, and they could work with them. He undertook to pay constant and fixed attention to the matter in his own district, and he trusted that the other members of Council would do the same in their localities.

The resolution was then put and carried unanimously, and, after further remarks by Mr. CHARLES HOWARD, Sir JACOB WILSON, and the Earl of POWIS, it was agreed that a letter signed by the President should be sent to the President of the Board of Agriculture, together with copies of the resolutions.

It was also decided that a circular letter signed by the President should be issued to all the governors and members of the Society, asking for their co-operation in the matter, and that letters should be addressed to the Society's Provincial Veterinary Surgeons as suggested by the Veterinary Committee, whose report was then adopted.

The following is the text of the President's letter to the Board of Agriculture, and of the circular to the Members of the Society:—

President's Letter to Board of Agriculture.

Royal Agricultural Society of England,
12 Hanover Square, London, W.:
30th July, 1890.

SIR,—I have laid before the Council your letter to me of the 16th instant (No. 5,121), in which, by direction of the President of the Board of Agriculture, you ask this Society to give its assistance in carrying out the duties imposed upon your Board by the Pleuro-pneumonia Act of this Session, and to exercise its influence in securing for the Board the earliest intimation of outbreaks of the disease.

The Council desire me to say in reply that they will very readily afford every assistance in their power in carrying out the provisions of the Act; and, desiring to co-operate to the utmost possible extent in the efforts of the Board of Agriculture to stamp this disease out of the country, the Council have given in-

VOL. I. T. S.—3.

structions for the issue of a circular letter to all the Members of the Society, impressing upon them the great importance of prompt declaration of disease whenever it may appear, and of a loyal submission to the Orders which may from time to time be issued by your Board under the Act. The Council have further requested all Members to use their influence in this direction in their respective localities.

I am at the same time to state that the Council have called upon the Provincial Veterinary Surgeons whom they have appointed in each county to telegraph immediately to the Society, at its expense, information of every outbreak of pleuro-pneumonia occurring within their districts, or otherwise coming under their cognisance. All information thus received will be immediately placed at the disposal of your Board.¹

I am, Sir, your obedient Servant,
RAVENSWORTH,
President.

The Secretary of the Board of Agriculture.

Circular Letter to Governors and Members.

Royal Agricultural Society of England,
12 Hanover Square, London, W.
August, 1890.

DEAR SIR,—I am requested by the Council to draw your attention to the provisions of the Contagious

¹ To this letter the President has since received the following reply, dated 4th August, 1890:—

My Lord,—I have submitted to the Board of Agriculture your Lordship's letter, with inclosures of the 30th ultimo, stating that the Council of the Royal Agricultural Society of England will very readily afford every assistance in their power in carrying out the provisions of the recent Pleuro-pneumonia Act, and with that view have given instructions for the issue of a circular to Members of the Society, impressing upon them the great importance of the prompt declaration of disease and a loyal submission to the Orders which may be issued by the Board of Agriculture.

In reply, I am directed by the President to say that the Board much appreciate the steps taken by the Royal Agricultural Society, with the view of assisting the Board in carrying out the Pleuro-pneumonia Act of 1890.

I am, my Lord, your Lordship's obedient Servant,

G. A. LITCH.
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Diseases (Animals) (Pleuro-pneumonia) Act, 1890, conferring upon the Board of Agriculture further powers for dealing with cattle affected with pleuro-pneumonia, and to the correspondence on the subject of the Act which has passed between the Board and this Society, a copy of which is enclosed herewith.

As the Board of Agriculture remark in their letter of the 16th July, the success of the Act will largely depend upon the cordial co-operation of the owners and breeders of stock, and of persons connected with the cattle trade throughout the country.

It is essential for the proper performance of their duties that the Board should receive in every case, so soon as it is known, prompt and certain information of the existence of the disease; and the Council feel it incumbent upon the Society (which has taken so prominent a part in urging upon the Government central action of the kind now contemplated) to afford to the Board the utmost possible assistance in carrying out the provisions of the Act.

With this view the Council have desired me to impress upon every Member of the Society the great importance of prompt declaration of disease whenever it may appear, and of a loyal submission to the Orders which may from time to time be issued by the Board of Agriculture.

The Council do not doubt that they will have your cordial support in carrying out these views, and that you will use all your influence in this direction in your own locality.

I am, dear Sir, yours faithfully,
RAVENSWORTH,
President.

Stock Prizes.

Mr. SANDAY (Chairman) reported that, under Rule 9, Mr. Walter Gilbey's *British Ore III.* was disqualified from receiving the Third Prize in Class 28 at the Plymouth Meeting, and that Mr. J. Porter's Andalusian Cock (No. 487) was disqualified from receiving the First Prize of Class 221 under Rule 63. The

following were the exhibits succeeding to the prizes, and the Committee recommended that the awards of the Plymouth Meeting be altered accordingly:—

Class 28.—Third Prize, Mr. W. B. Longton's *Cronton Magna Charta* [awarded Reserve Number].

Class 221.—First Prize, Mr. D. Butterfield [awarded Second Prize]; Second Prize, Mr. Edwin Merrill [awarded Third Prize]; Third Prize, Mr. W. F. Le Boutillier [awarded Reserve Number].

Implement.

Mr. FRANKISH (Chairman) reported that six entries [since increased to nine] had already been received for the trials of threshing machines next year.

The Committee had had before them a correspondence on the subject of an instantaneous butter maker, entered by the Dairy Supply Company as a "new implement" at the Society's recent Meeting at Plymouth. The regulations governing the entry of "new implements" for the Society's silver medals precluded the granting of a medal "unless the principle of the implement, or the principle of the improvement of it, be entirely new," and an exhibitor was required to "define clearly the exact nature of the novelty which entitles such implement to compete for a medal." (Regulation 25.) In the original specification of the machine in question, received by the Society on the 5th April, the article was described as "an instantaneous butter maker, Laval's patent, for the making of butter direct from milk," and in a further specification received from the Company on the 7th May, in reply to a letter from the Secretary dated the 2nd of that month, they gave "the continuous manufacture of butter from cream" as "the precise definition of the exact nature of the novelty which entitles the implement to compete for a medal." In view of the positive instructions of Regulation 25, the Judges felt that they were precluded from recommending a silver medal to this butter maker on the ground on which the Dairy Supply Company submitted it, viz., "the continuous manufacture of butter

from cream," which was not a novelty. But, as it appeared from the Judges' report that in a particular portion of the machine, viz., in the application of a refrigerator between the separator and the churn, there was novelty and merit, the Stewards had decided to lay the whole of the facts before the Council, and to ask for their instructions as to whether they would waive the technical objection arising out of the Company's insufficient description of the novelty of the implement. In view of the fact that this was the first year in which the regulation in question had appeared in its present form, the Committee recommended the Council to grant the Dairy Supply Company a silver medal for "the application of a refrigerator between the separator and churn in an instantaneous butter maker."

The Judges of Miscellaneous Implements having reported that, although in some of the "new implements" entered for silver medals the claim to novelty was very weak, yet they did not think it was necessary for the Society to retain the entry fee in any case, the Committee recommended that all the entry fees for "new implements" be returned by the Council to the exhibitors.

Trials of Cider Making Machinery.

Mr. FRANKISH also reported that the Implement Committee had agreed upon the following regulations for the trials of cider making machinery, and recommended their issue forthwith:—

1. The trials of the machinery already entered for competition for the Society's prizes of £20 and £10 for "the best plant for cider making suitable for use on a farm," will be held at Glastonbury, Somerset, in the week commencing Tuesday, October 14th, 1890.

2. The machines must be delivered by the competitors at the trial field not later in any case than Wednesday, October 8th.

3. The Society will provide the necessary apples for the trials, together with horse or steam power for working the machines, which should be fitted with a pulley for a belt. Every other requisite for showing the system (such as bags, cloths, straw,

pails, tubs, buckets, funnels, strainers, &c.) must be provided by the exhibitors. (If an exhibitor should wish to grind his apples by hand power instead of by horse or steam power, he must himself make arrangements for the necessary labour.)

4. Tickets of admission to the trial field will be sent by post to the exhibitors and their assistants. Members of the Society will also be admitted on making previous application for tickets to the Secretary.

Showyard Works.

Mr. HOWARD stated that the whole of the buildings in the Plymouth showyard were levelled to the ground, and the greater portion of the Society's plant removed to Doncaster.

Dairy.

Mr. MAINWARING submitted accounts for payment in connection with the Plymouth Meeting. Various suggestions for prizes were postponed until the preparation of the Doncaster prize sheet was undertaken.

International Congress of Hygiene, 1891.

The SECRETARY read the following letter from the Honorary Secretaries of the International Congress of Hygiene and Demography, to be held in London in August 1891, under the presidency of H.R.H. the Prince of Wales, K.G.:—

74A, Margaret Street, W.

July 26th, 1890.

DEAR SIR,—We are instructed by the Organising Committee to ask you if you will be good enough to bring before the Council of the Royal Agricultural Society the accompanying statement respecting the International Congress of Hygiene and Demography, to be held in London next year, under the presidency of H.R.H. the Prince of Wales.

It is proposed to consider among the subjects which will engage the attention of the Congress, the relation of diseases of the lower animals to those of man, particularly in regard to food supply; and it is thought that there will be advantages to the public in co-ordinating

the experience which has been gained in this and other countries on this point.

The Organising Committee trust that the Royal Agricultural Society, which has done so much to promote the knowledge of all matters concerning the health of animals, will be willing to take part in the Congress, and appoint two delegates to act on the General Committee, and they would regard as especially valuable this co-operation on the part of the Royal Agricultural Society.

We remain, dear Sir,

Your obedient Servants,

W. H. CORFIELD, } Honorary
SHIRLEY F. MURPHY, } Secretaries.

Ernest Clarke, Esq.

It was unanimously resolved that this invitation be accepted, and on the recommendation of the Veterinary Committee, the President (the Earl of Ravensworth), and the Chairman of the Veterinary Committee (Sir John Thorold), were appointed as the two delegates to represent the Society on the Committee.

International Agricultural Congress at Vienna.

Copies were laid upon the table of the official detailed programme of the International Congress of Agriculture and Forestry to be held in Vienna in the first week of September, at which Congress the Council resolved at their meeting on the 2nd of April, that the Society should be officially represented by the Secretary as well as by any Member of Council who might desire to attend.

The PRESIDENT said that as it was desirable the Society's representative should have as many facilities as possible for taking part in the Congress, and for the inspection of the great breeding establishments in Hungary which would follow it, he had put himself in communication with the Marquis of Salisbury, and had had a personal interview with the Premier on the subject. Lord Salisbury had received him most kindly, and had not only officially requested Her Majesty's Ambassador in Vienna to render all the assistance in his power to their Secretary in furtherance

of the object of his visit, but had also communicated privately with Sir Augustus Paget on the subject. He thought the Council should recognise the courtesy of the Prime Minister in granting these facilities.

The SECRETARY said that the President of the Congress, the Baron von Hohenbruck, of the Austrian Ministry of Agriculture, with whom he had been in frequent correspondence, had personally requested him to do his best to make the scope and objects of the Congress generally known in this country, with a view to securing as large an attendance of Englishmen as possible. The Baron had forwarded to him a considerable supply of copies of both the German and French editions of the programme, which was a pamphlet of sixty pages; and he (the Secretary) should be glad to have the permission of the Council to distribute from the Society's offices any copies of the programme that might be applied for.

This permission was granted by the Council; and it was also decided, on the motion of the Earl of POWIS, seconded by Mr. HOWARD, that the Secretary should pay an official visit to the International Exhibition of Butter and Cheesemaking, to be held in Pavia in September—as to which a letter had been received from the Board of Agriculture—in the event of his being in the neighbourhood, as he was contemplating, in the course of his vacation.

Miscellaneous.

A letter was read from the Agricultural Engineers' Association, thanking the Council for allowing the Association the use of the large tent in the show-yard for the purposes of a meeting.

On the motion of Mr. SANDAY, seconded by Mr. HOWARD, the date of the general meeting of Governors and Members in December next was fixed for the Thursday of the Smithfield Show week (December 11th). This meeting will be held in the Great Hall of the Royal Medical and Chirurgical Society, 20, Hanover Square.

Date of next Meeting.

The usual holidays having been granted to the Secretary and Clerks, the Council adjourned until Wednesday, November 5th, 1890, at noon.

Proceedings at General Meeting of Governors and Members,

HELD IN THE LARGE TENT IN THE

SHOWYARD AT PLYMOUTH.

TUESDAY, JUNE 24, 1890.

LORD MORETON (PRESIDENT) IN THE CHAIR.

Present on the Platform:

Trustees.—Gen. Viscount Bridport, K.C.B., Earl Cathcart, Mr. J. D. Dent, Col. Sir Nigel Kingscote, K.C.B., Duke of Richmond and Gordon, K.G.

Vice-Presidents.—Earl of Feversham, Mr. Walter Gilbey, Right Hon. Sir Massey Lopes, Bart., Earl of Ravensworth, Sir J. H. Thorold, Bart.

Other Members of Council.—Mr. J. Bowen-Jones, Mr. James A. Caird, Mr. H. Chandos-Pole-Gell, Mr. Charles Clay, Earl of Coventry, Mr. Percy E. Crutchley, Mr. Alfred Darby, Viscount Emlyn, Mr. William Frankish, Mr. Charles Howard, Mr. O. S. Mainwaring, Mr. P. Albert Muntz, M.P., Mr. Albert Pell, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. S. Rowlandson, Mr. G. H. Sanday, Sir J. L. E. Spearman, Bart., Mr. Martin J. Sutton, Mr. John Tremayne, Mr. C. W. Wilson, Sir Jacob Wilson.

Officers of Plymouth Local Committee.—The Mayor of Plymouth, Mr. Charles Norrington (Treasurer), Mr. Richard B. Johns (Hon. Secretary).

There was also in the tent a large attendance of the general body of Governors and Members.

Award of Farm Prizes.

The first business of the Meeting was the announcement of the Award of the Judges of the Farm Prize Competition. The seal of the envelope containing the award having been broken, the SECRETARY read the Report of the Judges as follows:—

CLASS 1.—Arable and grass farm of 200 acres and upwards, of which not less than one-half is arable:

First Prize, 60*l.*, to W. P. Vosper, of Merafield, Plympton, Plymouth.

Second Prize, 40*l.*, to J. N. Franklin, of The Bussels, Huxham, Exeter.

Highly Commended, H. M. Hill and Son, of Newtake, Staverton, Totnes.

Commended, John S. Ford, Sen., of Hall Torrs, Yealmlton, Plymouth, and William Lawry, of Trevor Gorran, St. Austell.

CLASS 2.—Arable and grass farm above 100 acres and not exceeding 200 acres, of which not less than one-half is arable.

First Prize, 60*l.*, Edward Cornish, of East Farm, Charleton, Kingsbridge.

Second Prize, 40*l.*, John S. Ford, Jun., of Luson Holbeton, Ivybridge, Plymouth.

Highly Commended, Charles Horn, of Blowiscombe, Yelverton, Tavistock.

Commended, Henry Quartly, of Molland, South Molton.

CLASS 3.—Arable and grass farm above 40 acres and not exceeding 100 acres.

First Prize, 50*l.*, James W. Lawry, of St. Mellion, Saltash.

Second Prize, 30*l.*, Charles Bath, of Gear Farm, Camborne.

Third Prize, 20*l.*, Edmund F. Damerell, of Colwell Farm, Egg Buckland, Crown Hill, Plymouth.

The Judges further recommend that a Special and Third Prize be given to Mrs. Hill and her Son, of Staverton (Competitors in Class 1), for the excellence of their management in general, and in particular for their treatment and production of Cider, the latter being a branch of Devonshire farming which, in the opinion of the Judges, might be more profitably developed, especially if treated in the method followed by these competitors.

JAMES A. CAIRD
JOSEPH B. HILL
FREDK. PUNCHARD } Judges.

June 16, 1890.

Mr. CHARLES NOBBINGTON said that, as Treasurer of the Local Committee, who were responsible for the prizes for farms, he thought he might undertake to say that they would be willing to find an extra third prize of 20l. in Class 1, in order to carry out the recommendation of the Judges. (Cheers.)

Presentation of Stallion Medals.

The PRESIDENT next presented the Gold Medals awarded by the Society at the Spring Show of Thoroughbred Stallions to Mr. Isaac Clark for *Jack Tar*, Mr. G. P. Finch for *Eclipse*, and Mr. Alex Taylor for *Launceston*.

Vote of Thanks to Mayor and Corporation of Plymouth.

The Duke of RICHMOND and GORDON then moved:—

That the best thanks of the Society are due and are hereby tendered to the Mayor and Corporation of Plymouth for their cordial reception of the Society.

His Grace said he thought they would all agree with him that the Show being held at Plymouth was a very great trial for the Society after the magnificent display at Windsor last year. At Plymouth they had not a historic castle with the Royal Standard floating over it, but they had one of the most magnificent views which could be seen, he imagined, in any part of the country; and they had had that which was even more to be appreciated than the view itself, viz. the most cordial re-

ception from all classes in the West Country. (Cheers.) Everything had conduced to the success of the Meeting. They had, as compared with the Show that took place on the same ground a quarter of a century ago, nearly double the number of animals exhibited. Whereas, in 1865, 857 animals were shown, 1,769 were exhibited on the present occasion, or nearly double, to say nothing of the considerable increase in the machinery. But all their endeavours to send the best animals would have been in vain unless they had received the co-operation of the inhabitants of the district. He thought they were especially indebted to the Mayor and Corporation for the reception which they had given them. He was reminded by a page in the prize-sheet that out of the total money given in prizes on the present occasion, amounting to over 6,000l., one-sixth had been subscribed by Plymouth and the county of Devon. (Cheers.) But with all the efforts of the neighbourhood, and with all the desire of the town of Plymouth to do them honour and provide the funds necessary, it would be perfectly useless for them to attempt anything unless they had one organising head, and he thought they were specially fortunate on the present occasion, for the Mayor of Plymouth had taken a most active and energetic part in the management of the proceedings. (Cheers.) He was afraid to say the number of journeys the Mayor had taken to London and back in the interest of the Society. To a busy man this must have involved a great expenditure of time, labour, and effort. Mr. Waring had been elected, he believed, no less than three times Mayor of Plymouth. Unless he was very much maligned, the Mayor was a gentleman who liked to do everything for himself, and was one of those people who thought that when a thing was to be done they had better do it themselves if they wanted it done properly. Certainly, as far as the members of the Royal Agricultural Society were concerned, their deepest gratitude was due to the Mayor for the manner in which he had fulfilled the duties of his office. If they wanted to find out a man's character they had better go to his

friends, and the fact that Mr. Waring had been elected by his fellow-citizens three times Mayor was a pretty good index of the kind of man he was.

Sir JACOB WILSON, in seconding the motion, said that, having personally been very frequently in the society of the Mayor during the last two years, he could only assure them that he had never met with anyone in a similar position who had so thoroughly fulfilled all that was required by the Society. In fact, he might say, they could describe the Mayor of Plymouth as "the best Mayor for agricultural purposes."

The resolution was then put by the President, and carried unanimously.

The MAYOR of PLYMOUTH said that the most kind words of His Grace, and the way in which the meeting had endorsed them, had almost overwhelmed him. He had from the first taken an active interest in the visit of the Royal Agricultural Society to Plymouth, and he should continue to do so up to the end of the chapter. As His Grace had mentioned, he had great faith in doing things for himself; but he could not take all the praise to himself. Single-handed, he could have done nothing compared with what had been accomplished. His colleagues one and all had assisted him in every possible way, and they had worked most harmoniously together. The warmest thanks of everyone were due to Sir Massey Lopes, Chairman of the Local Executive Committee; and he could assure them that a better leader than Sir Massey it would be impossible to find. He most cordially thanked Lord Moreton and the members of the Society on behalf of himself and the Corporation of Plymouth. What they had done had been a labour of love from the very commencement. The work was now brought very nearly to a close, and if they wanted any proof of the success of their labours they saw it in the Showyard that day.

Vote of Thanks to Local Committee.

Mr. DENT said he supposed he had been asked to propose the next vote of thanks because he was one of the surviving officials of the show held in Plymouth twenty-five years ago.

When he came down to Plymouth in 1865 to carry out his duties as Senior Steward of Stock, he had just been fighting a sharply contested election and had been canvassing and fighting for five weeks; and, although he won his seat, the friends of his opponent had pelted him with eggs on the hustings at the final part of the proceedings. They might well suppose that when, after such an experience as that, he came to a pleasant place like Plymouth, amidst such beautiful scenery and such charming people—many of them very old friends—he had thoroughly enjoyed the week, and he hoped he should enjoy the week on the present occasion equally well.

But twenty-five years' reminiscences, however pleasant, could not but be mingled with a good deal of sadness, and he could not help thinking of the losses which the "Royal" Society and England had since then sustained in the agricultural world. He thought of the kindly and accomplished President of 1865, Sir Edward Kerrison, who after many years of suffering had gone over to the great majority, and of two colleagues as Stewards of Stock—Mr. Randell and Mr. Bowly—than whom there were no better specimens of the British Agriculturist. He remembered also that the first to greet him on coming into the yard twenty-five years ago was Professor Simonds, who told him that the rinderpest had broken out in the dairies of London. When one thought of these things, and of the sad times agriculture had gone through since then, one's reminiscences became a little tinged with sadness. However, there was now a brighter gleam, and there were better hopes for British agriculture, and the young men of the Council had shown that they were as good as their predecessors.

But what could they have done had it not been for the exertions of the Local Committee? He was glad to think that the Chairman of the Local Committee twenty-five years ago was his present genial host, Sir Massey Lopes, and that he was still acting in the same capacity. It needed no words from him to an audience of West-countrymen to inform them how much he was respected and esteemed by everyone.

who knew him: Those who had sat with him in the House of Commons knew what an excellent Member of Parliament he made; and those who had worked with him on the Council of the Royal Agricultural Society, whether as President or in any other capacity, knew what an excellent man of business he was. To Sir Massey Lopes and to the other members of the Local Committee, he was sure they would be glad to render their sincere and hearty thanks, and he had therefore great pleasure in moving, "That the best thanks of the Society are due and are hereby tendered to the Local Committee for their exertions to promote the success of the Show."

Sir NIGEL KINGSCOTE seconded, referring to the thorough success of the Meeting from an agricultural point of view, and said it seemed as if it were going to be a thorough success as regarded attendance. He only hoped they would see the Cornish and Devon farmers trooping to the Show with their wives and families, in order to see what differences had taken place in the live stock and implements during the past twenty-five years. (Cheers.)

The vote of thanks having been unanimously accorded,

Sir MASSEY LOPES, on behalf of the Local Committee, returned most hearty and sincere thanks for the way in which their services in endeavouring to make the Meeting a success had been acknowledged. He must say that the encomium which fell from the noble Duke was one which was peculiarly acceptable and gratifying to them, inasmuch as His Grace had always been considered one of the first and foremost champions of the agricultural interest, not only in England but in Scotland.

It was his good fortune some quarter of a century ago to have been also the Chairman of the Local Committee, and he had been associated during the past two years with many gentlemen who had assisted him on that occasion. Every one had exerted himself to the utmost to secure the success of the Meeting. He recollected that twenty-five years ago it was predicted that the Plymouth Meeting was to be a failure, but they were ex-

ceedingly pleased to find that the whole Council and a great number, if not the majority, of the members admitted it to be not only a financial success, but also, in a pleasant and agreeable way, one of the nicest Meetings they had ever held. There was another side to the picture. Those who took some little trouble in getting the money together for that Meeting had the gratification of knowing that the Society left its mark behind it and gave a great stimulus to the agriculture of the neighbourhood. They fully expected to see the same good results from the present Meeting. It was true that the Executive had on this occasion some little difficulties to overcome. They had but one possible site in the district, and that site could only be secured by a considerable expenditure. But they did not for a moment regard that as an insurmountable obstacle, and they were determined from the first to do their very best to make the Meeting a success. They felt that they had a character to lose and a character to maintain, and it had been their anxious desire to deserve a renewal of the encomiums which had been hitherto passed upon them. They were essentially an agricultural district in the West of England. Agriculture was their staple commodity. Agriculture—the oldest and noblest of industries—was really the backbone of their national industries as well as of their national prosperity. They were amply compensated by, and they very much appreciated, the kind terms in which their services had been recognised.

Vote of Thanks to Retiring President.

The PRESIDENT then asked if any Members present had remarks to make or suggestions to offer for the consideration of the Council; but no one rising in response to this invitation,

Mr. HENRY SMITH, of Leamington, proposed a vote of thanks to Lord Moreton for his services as President during the past year. He said it must be a great gratification to Lord Moreton to see such a Meeting as they had this year in the extreme part of Devon. It was fifty-one years since he first joined the Royal Agricultural Society. When he was at Oxford

fifty-one years ago the showyard was comparatively very small. Those who had long been members of the Society would agree with him that they owed as farmers a great deal to the Royal Agricultural Society. He had attended most of the Meetings, and he had seen a gradual improvement in every description of agriculture, mainly promoted by the Royal Agricultural Society. As a practical farmer he felt very grateful for what the Society had done for them. He had for himself, and on the part of those who were original members at the Meeting fifty-one years ago, to thank the Council for the honour which they had done them in making them Foundation Life Governors. He was sure he spoke for every other member when he proposed a vote of thanks to Lord Moreton for his services as President during the past year.

Mr. J. C. MOORE STEVENS, as one of the oldest members of the Society, had great pleasure in seconding the vote of thanks to one whom he had known as a thorough agriculturist. He remembered very well the foundation of the "Royal" at a time of life when one looked at things happily—when he had passed his last examination. He remembered seeing the quadrangle at Queen's being formed for the reception of the "Royal" at dinner. The Society was very different then to what it was now. He was very glad to see in the chair his friend Lord Moreton, who had so well done his duty. (Cheers.)

The resolution was then put by the SECRETARY and carried by acclamation.

LORD MORETON, in reply, expressed his hearty and sincere acknowledgment of the vote of thanks, and took the opportunity of thanking his colleagues on the Council, the officials

of the Society, and every member with whom he had come into personal contact during his year of office, for the kindness and courtesy with which they had always helped and worked with him. He thought they might congratulate themselves on the Show. He only hoped the beautiful weather would continue, and that they might have as good an attendance as they had begun with that day.

President for 1890-91.

On the motion of Mr. RALPH PALMER, seconded by Mr. JOHN WOOD, it was then resolved that the Earl of Ravensworth do take the chair as President after the conclusion of the present Meeting.

LORD RAVENSWORTH, replying, said he should endeavour as far as possible to follow in the steps of the many distinguished men who had filled that chair in previous years. He expressed, as a perfect stranger to Plymouth, his intense delight and wonderment at the lavish way in which Nature had assisted in adorning that excellent showyard. Never had he witnessed a more beautiful scene than that which could be enjoyed from almost every point in the yard.

He was very early taught at Eton to appreciate the character of Devonshire men. Some of his nearest and dearest friends when at Eton were Devonshire men, and he had learned to appreciate their honest, straightforward, English ways. He was happy to see present one of his most intimate friends, Mr. John Tremayne, whose name it was only necessary to mention to show what a Devonshire man is and ought to be. He assured them that he would endeavour to fill the position in which they had placed him to the best of his ability, and no man could do more.

The proceedings then terminated.

PLYMOUTH MEETING.

JUNE 21 TO 27, 1890.

PRESIDENT :

LORD MORETON.

Sarsden House, Chipping Norton, Oxon.

OFFICIALS :

Honorary Director.

Sir JACOB WILSON, Chillingham Barns, Belford, Northumberland.

Stewards of Live Stock.

T. H. MILLER, Singleton Park, Poulton-le-Fylde, Lancashire.

Viscount EMLYN, Golden Grove, Carmarthen, South Wales.

C. S. MAINWARING, Galtfaenan, Trefnant, R.S.O., North Wales.

J. BOWEN-JONES, Emsdon House, Montford Bridge, Salop.

Stewards of Implements.

HUGH GORRELL, Kingston-by-the-Sea, Brighton.

JAMES A. CAIRD, Northbrook, Micheldever, Hants.

PERRY E. CRUTCHLEY, Sunninghill Park, Ascot.

Steward of Dairying, Poultry, and Produce.

The Hon. CECIL T. PARKER, Eccleston, Chester.

Steward of Forage.

THOMAS PITTS, Jun., 28 Southside Street, Plymouth.

Stewards of Finance.

W. FRANKISH, Limber Magna, Ulceby, Lincolnshire.

G. H. SANDAY, Langdale Lodge, Clapham Park, Surrey.

Secretary.

ERNEST CLARKE, 12 Hanover Square, London, W.

JUDGES OF IMPLEMENTS.

Implements, &c., competing for Prizes.

Class 1 (Motors).

DANIEL PIDGEON, Assoc. Inst. C.E.,

Walsingham House, Piccadilly, W.

Professor UNWIN, F.R.S., 7 Palace

Gate Mansions, W.

Class 2 (Grist Mills).

JAMES EDWARDS, Belmont, Flax

Bourton, Bristol.

DANIEL PIDGEON, Assoc. Inst. C.E.

THOMAS STIRTON, West Stratton,

Micheldever.

Class 3 (Disintegrators).

DANIEL PIDGEON, Assoc. Inst. C.E.

Professor UNWIN, F.R.S.

Class 4 (Plant for Cider-Making).

FREDK. J. HAYES, The Elms, West

Pennard, Glastonbury.

DANIEL PIDGEON, Assoc. Inst. C.E.

Classes 5-9 (Dairy Appliances).

THOMAS CARRICK, The Nook, Haydon

Bridge, Northumberland.

JAMES LONG, Stanbridge Hall,

Romsey.

Miscellaneous Implements.

JAMES EDWARDS.

THOMAS STIRTON.

JUDGES OF STOCK, &c.

HORSES.

Hunters.—Classes 1-5.

HON. HENRY BOURKE, Milbourn,
Esher, Surrey.
GEORGE DOVE, Eccles, Kelso, N.B.
WILLIAM WRIGHT, Wollaton, Nottingham.

Coach Horses.—Classes 6-9.

THOMAS PARRINGTON, 12 St. Hilda's
Terrace, Whitby.
GEORGE ROBSON, Shires House,
Easingwold.

Hackneys.—Classes 10-16.

CHARLES E. COOKE, High House,
Litcham, Swaffham.
THOMAS ROBSON, Wold House, Drif-
field.

Ponies.—Classes 17-26.

T. H. HUTCHINSON, The Manor House,
Catterick, Yorkshire.
JOSEPH HARPER, M.D., Barnstaple.

Shire.—Classes 27-33.

JOHN W. ROWLAND, Fishtoft, Boston.
GARRETT TAYLOR, Trowse House,
Norwich.

Clydesdale.—Classes 34-38.

DAVID ALSTON, Crosslee, Stow, Mid-
lothian, N.B.
DAVID BUCHANAN, Garscadden
Mains, New Kilpatrick, N.B.

Suffolk.—Classes 39-45.

THOMAS GIRLING, Frostendon, Wang-
ford, Suffolk.
HENRY SPURLING, 81 Princes Street,
Ipswich.

Agricultural.—Classes 46-48.

J. D. LANG, Knowle, near Sidmouth,
Devon.

[And the Judges of Shires,
Classes 27-33.]

CATTLE.

Shorthorn.—Classes 49-54.

CHARLES HOWARD, Biddenham, Bed-
ford.
JOHN WOOD, 2 Harewood Hill, Dar-
lington.

Hereford.—Classes 55-60.

AARON ROGERS, The Rodd, Kingston,
Herefordshire.
WILLIAM THOMAS, The Hayes, Sully,
Cardiff.

**Devon and South Devon.—Classes
61-72.**

JOHN JACKMAN, Park, Chillaton, Lew
Down, N. Devon.
JOHN WROTH, Coombe, Bigbury,
Kingsbridge.

**Sussex and Red Polled.—Classes
73-76 and 81-84.**

THOMAS BROWN, Markham Hall,
Downham Market.
ALFRED STANFORD, Eatons, Steyning,
Sussex.

Welsh.—Classes 77-80.

J. M. GRIFFITHS, Penally Court, near
Tenby.
[And the Judges of Herefords, Classes
55 to 60.]

Jersey.—Classes 85-90.

A. W. BYRON, Sutton Estate Office,
Duckmanton, Chesterfield.
HUGH C. SMITH, Mount Clare, Roe-
hampton.

Guernsey.—Classes 91-94.

HON. and REV. A. C. BAILLIE-
HAMILTON, Combs, Stowmarket.
H. CHARLES SMITH, Caledonia
Nursery, Guernsey.

**Kerry and Dexter Kerry.—Classes 95-
100.**

ROBERT MCCLURE, Glenhazel, Ken-
mare, Co. Kerry.
JAMES BLYTH, Wood House, Stansted,
Essex.

SHEEP.

**Leicester, Cotswold, and Lincoln.
Classes 102-113.**

THOMAS CASSWELL, Pointon House,
Folkingham.
ROBERT JACOBS, Signett Hill, Bur-
ford, Oxon.
BENJAMIN PAINTER, Burley-on-the
Hill, Oakham.

Oxford Down.—Classes 114-117.

JAMES P. CASE, Testerton House,
Fakenham.
A. P. MILTON DEUCE, Fyfield, Abing-
don.

Shropshire.—Classes 118-121.

CHARLES COXON, Elford Park, Tam-
worth.
J. E. FARMER, Felton, Ludlow.

Southdown.—Classes 122–125.

A. HEASMAN, Court Hill, Littlehampton.

JOHN A. HEMPSON, Erwarton Hall, Ipswich.

Hampshire and Suffolk.

Classes 126–133.

FRANCIS P. BROWN, Compton, Newbury.

G. M. SEXTON, Stone Lodge, Ipswich.

Somerset and Dorset Horned.

Classes 134–136.

JOHN CHICK, Compton Valence, Maiden Newton, Dorset.

HENRY MAYO, Cokers Frome, Dorchester.

Devon Long-wool and South Devon.

Classes 137–142.

JOHN CARPENTER, Blagdon, Paignton.

WILLIAM RENDELL, Netherton Manor, Newton Abbot.

Dartmoor and Exmoor.

Classes 143–148.

J. D. PALMER, Great Close, Bridestowe, N. Devon.

HENRY QUARTLY, Molland, South Molton.

INSPECTOR OF SHEARING.

WILLIAM JOBSON, Ashfield, Heaton, Newcastle-on-Tyne.

FIGS.

Whits.—Classes 149–160.

WALTER J. HENMAN, Caversham, Reading.

JOHN PATTEN, Park Farm, Alnwick.

Berkshire, Black, and Tamworth.

Classes 161–172.

H. CHANDOS-POLE-GELL, Hopton Hall, Wirksworth.

ARTHUR W. CRISP, Hill House, Orford, Suffolk.

HEBER HUMFREY, Shippon, Abingdon.

POULTRY.

Classes 173–251.

D. BRAGG, Southwaite Hall, Carlisle.

O. ERNEST CRESSWELL, Morney Cross, Hereford.

M. LENO, Cox Pond Farm, Hemel Hempstead.

WOOL.

Classes 252–255.

JOSEPH HAMLYN, Bilberhill, Buckfastleigh, Devon.

PRODUCE.

Cheese.—Classes 256–261.

GEORGE LEWIS, Ercall Park, Wellington, Salop.

JABEZ CROSLAND, Clumber Street, Nottingham.

Butter.—Classes 262–266.

THOMAS CARRICK, The Nook, Haydon Bridge, Northumberland.

JAMES LONG, Stanbridge Hall, Romsey, Hants.

Cider and Perry.—Classes 267–270.

RICHARD C. MERSON, Maristow Cottage, Boborough, S. Devon.

Jams and Preserved Fruits.—Classes 271–275.

THOMAS WOOD, Swanley, Kent.

Hives and Honey.—Classes 276–290.

W. B. CARR, 17, King William Street, Strand, W.C.

THOMAS W. COWAN, Comptons Lea, Horsham.

WALTER MARTIN, Wainfleet, Lincolnshire.

REV. F. S. SCLATER, Westmeston Rectory, Sussex.

COMPETITIONS.

Farms.

JAMES A. CAIRD, Northbrook, Micheldever.

JOSEPH B. HILL, Smethwick Hall, Congleton.

FREDERICK PUNCHARD, Underley, Kirkby Lonsdale.

Butter-making.

THOMAS CARRICK, The Nook, Haydon Bridge, Northumberland.

JAMES LONG, Stanbridge Hall, Romsey.

Horse-shoeing.

JAMES D. BARFORD, Above Bar, Southampton.

CHARLES CLAY, Walton Grange, Wakefield.

AWARD OF PRIZES AT PLYMOUTH.

ABBREVIATIONS.

I., First Prize. II., Second Prize. III., Third Prize, &c. R. N., Reserve Number. H. C., Highly Commended. Com., Commended.

All Prize Winners in the Stock Classes are "bred by Exhibitor," unless otherwise stated.

HORSES.

Thoroughbred Stallions.

Winners of the Three Premiums of £200 and Special Gold Medals, offered by the Society, at the SPRING SHOW, held at THE ROYAL AGRICULTURAL HALL, LONDON, March 4 to March 7, 1890.

- A. GEORGE PERKINS FINCH, The Briars, Alphington, Exeter, for Eclipse, chestnut, foaled 1883; s. Van Amburgh or Ethus, d. Tormentor by King Tom; bred by Benjamin Ellam, Piccadilly, W. Served in the district of Exeter during the season of 1890.
- B. ISAAC CLARK, Heddington, Calne, for Jack Tar, brown, foaled 1881; s. Jolly Tar, d. Water Lily by Mariner. Served in the district of Plymouth during the season of 1890.
- C. ALEXANDER TAYLOR, Manton House, Marlborough, for Lancastrian, brown, foaled 1876; s. Toxophilite, d. Lady Sefton by West Australian; bred by The Glasgow Stud. Served in the district of Windsor during the season of 1890.

Hunters.

No. in
Cata-
logue

Class 1.—Hunter Mares and Foals. [7 entries, 1 absent.]

- 4 I. (£20.)—CAPT. JOHN DANBY, South Villa, Foggy Furze, W. Hartlepool, for Melrose, brown, foaled 1879 [foal by Pursebearer], bred by Thompson and Son, Kirk House, Carlisle; s. British Prince, d. Rosalind by Laughing Stock.
- 2 II. (£10.)—F. J. COLERIDGE BOLES, Coytrahen House, Bridgend, Glam., for Huntress 355, bay, foaled 1876 [foal by Pintarch], breeder unknown.
- 6 III. (£5.)—CHARLES MILES, Tatenhill, Burton-on-Tr., for Lavinia 74, brown, foaled in 1879 [foal by Pero Gomez], breeder unknown.

Class 2.—Hunter Fillies, foaled in 1887. [8 entries, none absent.]

- 13 I. (£15.)—J. M. MITCHELSON, The Hall, Pickering, Yorks., brown, bred by Mr. Dixon, Carnforth, Lancs.; s. Westerhall, d. by Gillie Callum.
- 12 II. (£10.)—COL. A. D. MACGREGOR, Maperton Ho., Wincanton, Som., for Medici, chestnut; s. Huguenot, d. Mischief 405 by Saturnalia.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 10 III. (£5.)—JOHN LETT, Cleveland Stud Farm, Rillington, Yks., for *Lioness*, brown, bred by John Bristow, Norton, Malton; s. Lord Glen Lyon.
15 B. N.—R. J. PRESTON WHYTE for *Madge Wildfire*; s. Marmion.

Class 3.—Hunter Fillies, foaled in 1888. [6 entries, none absent.]

- 17 I. (£15.)—MAJ.-GEN. JAGO-TRELAWNY, Coldrenick, Liskeard, for *The Nun*, chestnut; s. Grey Palmer, d. Jessie 363 by *Acrobat*.
20 II. (£10.)—CHARLES MILES, Tatenhill, Burton-on-Tr., for *The Queen*, brown; s. Pero Gomez, d. Lavinia 74.
19 III. (£5.)—CAPT. W. ST. JOHN MILDMAY, Wales Ho., Queen Camel, Bath, for *Princess of Wales*, bay, bred by Thomas Down, Long Burton, Sherborne; s. Master Ned, d. Polly 434.

Class 4.—Hunter Mares or Geldings, foaled in 1884 or 1885.¹

[25 entries, 5 absent.]

(a) LIGHT WEIGHTS UP TO 12 STONE.

- 36 I. (£20.)—F. B. WILKINSON, Blyth Spital, Rotherham, for *Danube*, brown gelding, foaled 1885, breeder unknown; s. Vienna.
33 II. (£10.)—A. M. SINGER, Redworth, Totnes, for *Nimrod*, bay gelding, foaled 1885, breeder unknown; s. Victor.
22 III. (£5.)—A. H. BLYTH, Garston Ho., Newton Abbot, brown gelding, foaled 1885, bred by T. Eland, Holme-on-Spalding Moor; s. Knight Templar.
34 B. W. & H. G.—H. W. THOMAS, Stonehouse, Plymouth, for *Louise*.

(b) WEIGHT CARRIERS UP TO 15 STONE.

- 42 I. (£20.)—H. E. LAMBE, Highbury Ho., Falmouth, for *Wizard*, bay gelding, foaled 1885, breeder unknown; s. Fairyland.
41 II. (£10.)—WM. JACKMAN, Caprera Terrace, Plymouth, for *Eugenie*, brown mare, foaled 1884, breeder unknown.
45 III. (£5.)—JOHN PETHICK, Norley Ho., Plymouth, for *The Milkman*, grey gelding, foaled 1884, bred by Mr. Moses, Hartley, near Plymouth; s. Smeaton Tower.

Class 5.—Hunter Mares or Geldings, foaled in 1886.¹

[23 entries, 7 absent.]

- 67 I. (£20.)—F. B. WILKINSON, Blyth Spital, Rotherham, for *Summertime*, chestnut gelding, breeder unknown; s. Conductor, d. *by* Best Returns.
63 II. (£10.)—H. W. THOMAS, Stonehouse, Devon, for *Cinnamon*, chestnut gelding, bred by T. Honey, Sibley Back, St. Cleer, Cornwall; s. Mulatto, d. Polly *by* Eastley.
66 III. (£5.)—R. J. PRESTON WHYTE, Leigh House, Chulmleigh, Devon, for *Avalanche*, brown gelding; s. Snowstorm, d. Buttercup *by* Gunboat.
51 B. N. & H. C.—JOHN CODNER, Woodside, Corfe, Taunton, for *Shamrock*.
54 H. G.—W. HOSKEN & SON, Loggans Mill, Hayle, for *Tiptop*.

Coach Horses.

Class 6.—Coaching Stallions, foaled before 1889. [13 entries, 3 absent.]

- 81 I. (£20.)—F. H. STERICKER, Westgate Ho., Pickering, Yorks., for *Master George*, bay, foaled 1888, bred by George Lancaster, Kilton Hall, Yorks.; s. General Gordon 182 Y.O.S.B., d. *by* Sir George 633.

¹ Prizes given by the Plymouth Local Committee.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 79 II. (£10.)—THE EARL OF LONDESBOROUGH, Londesborough Park, for Crown Prince 1308 Y.C.S.B., bay, foaled 1887; s. Prince Victor 376, d. Lady May 186 by Paulinus 343.
- 70 III. (£5.)—F. P. BAKER, Ingmanthorpe Grange, Wetherby, for Ingmanthorpe Baron 1362 Y.C.S.B., bay, foaled 1888, bred by J. A. Houfe, Skewkirk Hall, Tockwith; s. Baron Rothesay 981, d. by Stonewall Jackson 457.
- 74 R. N. & H. C.—JOHN KITCHING, Pickering, Yorks, for Topgallant.
- 75 Com.—JOHN LETT, for Rillington Count.

Class 7.—Coaching Mares and Foals. [1 entry, withdrawn.]

Class 8.—Coaching Fillies, foaled in 1887. [3 entries, none absent.]

- 85 I. (£15.)—F. H. STERICKER, Westgate House, Pickering, Yks., for Queen of Yetholme 453 C.B.S.B., bay, bred by M. Rudsdale, Danby, Yorks.; s. Prince George 235, d. Jubilee 376 by Wonderful 359.
- 83 II. (£10.)—JOHN LETT, Cleveland Stud Farm, Rillington, for Hartoft Maid, bay, bred by W. Pearson, Hartoft, Rosedale; s. Sportsman 299.

Class 9.—Coaching Fillies, foaled in 1888. [2 entries.]

- 87 I. (£15.)—GEORGE SCORY, Beadlam Grange, Nawton, Yorks., for Beadlam Belle 204 Y.C.S.B., bay; s. Charioteer 702 C.B.S.B., d. Hannah 55 by Salesman 417 Y.C.S.B.
- 86 II. (£10.)—F. W. HORSEFALL, Potto Grange, Northallerton, for Horsfall's Darling 532 C.B.S.B., bay; s. Fidius Deus 107, d. Star of the East 256 by Lord Cardigan 526.

Hackneys.

Class 10.—Hackney Stallions, foaled before 1888, above 15 hands.
[2 entries, 1 absent.]

- 88 I. (£20.)—G. H. K. FRANÇOIS, Mattishall, Dereham, for Doctor Syntax 877, black brown, foaled 1880; s. Confidence 157, d. Rosa 306 by Norfolk Jack 516.

Class 11.—Hackney Stallions, foaled before 1888, above 14 and not exceeding 15 hands. [6 entries, 1 absent.]

- 94 I. (£20.)—H. LIVESSEY, Rotherfield, Sussex, for Evolution 2058, chestnut, foaled 1886, bred by John Rutter, Cambridge; s. Reality 665, d. by Hue and Cry Shales 379.
- 91 II. (£10.)—WALTER GILBEY, Elsenham Hall, Essex, for Glandale 1790, brown, foaled 1887, bred by Garrett Taylor; s. Confidence 158, d. Kathleen 162 by Star of the East 798.
- 95 III. (£5.)—GARRETT TAYLOR, Trowse House, Norwich, for Gem 2082, brown, foaled 1886, bred by Lionel Rodwell, Burnham Overy, Norfolk; s. Confidence 158, d. Flying Scud 1544 by Hurdle.

Class 12.—Hackney Stallions, foaled in 1888.¹ [3 entries.]

- 96 I. (£15.)—H. LIVESSEY, Rotherfield, for Doncaster, chestnut, bred by E. W. Jackson, Winestead, Hull; s. Danegelt 174, d. May Blossom 1701 by Lord Derby 2nd 417.

¹ Given by the Hackney Horse Society.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 97 II. (£10).—T. H. MILLER, Singleton Park, Poulton-le-Fylde, for *Macumahan* (*late Traveller*) 2739, brown, bred by Arthur Gittus, Worlington, Soham; s. Grimsby 1491, d. Mrs. Thorpe 340.
- 98 B. N.—H. M. D. WILCOCKS, Pinhoe, Exeter, for *Zephyr*.

Class 13.—Hackney Brood Mares and Foals, above 15 hands.

[3 entries, 1 absent.]

- 101 I. (£15).—H. MOORE, Burn Butts, Cranswick, Hull, for *Sweetbriar* 514, brown, foaled 1883 [foal by *Rufus* 1343]; s. Denmark 177, d. Empress 95 by *Fireaway* 249.
- 99 II. (£10).—WILLIAM KING, 58, Southside St., Plymouth, for *Martinet*, bay, foaled 1886 [foal by *Cardigan*], bred by I. Nettle, St. Austell; s. Mulatto, d. Bessie by Billy Barlow.

Class 14.—Hackney Brood Mares and Foals, above 14 and not exceeding 15 hands. [1 entry.]

- 102 I. (£15).—H. LIVESY, Rotherfield, for *Lady Alice* 1170, chestnut, foaled 1884 [foal by *Maywood* 2181], bred by Mr. Bray, Branlingham, Brough; s. Lord Derby 2nd 417, d. by *King Charley* 392.

Class 15.—Hackney Mares or Geldings, foaled in either 1884 or 1885, not less than 14 and not exceeding 15 hands.¹ [7 entries, 2 absent.]

- 103 I. (£15).—WM. JACKMAN, Caprera Terrace, Plymouth, for *The Swell*, bay gelding, foaled 1885, breeder unknown.
- 104 II. (£10).—WM. JACKMAN, for *Dolly Varden*, chestnut mare, foaled 1885, breeder unknown; s. Siankes.
- 108 B. N.—REV. JOHN WARREN, Alvirdiscott, Barnstaple, for *May Queen*.

Class 16.—Hackney Mares or Geldings, above 15 hands.¹

[11 entries, 3 absent.]

- 116 I. (£15).—H. LIVESY, Rotherfield, for *Hedon*, bay gelding, foaled 1885, bred by Edward Vickerman, Patrington, Hull; s. Prince Charlie 1326, d. by *Bay President*.
- 115 II. (£10).—W. KING, 58 Southside St., Plymouth, for *Maritana*, bay mare, foaled 1885, bred by Mr. Reed, Woodland, Ashburton; s. Aide-de-Camp.
- 118 B. N.—H. W. THOMAS, Stonehouse, Plymouth, for *Graceful*.

Ponies.

Class 17.—Pony Stallions, not exceeding 14 hands.

[10 entries, 1 absent.]

- 122 I. (£15).—G. H. K. FRANCIS, Mattishall, Dereham, for *Lord Nimrod* 2164, black, foaled 1886; s. Doctor Syntax 877.
- 128 II. (£10).—C. W. WILSON, Rigmaden Park, Westmoreland, for *Little Wonder* 2nd 1610, brown, foaled 1883; s. Little Wonder 1237, d. Snorer 2456 by Sir George 778.
- 123 III. (£5).—R. T. S. LUCAS, Tudor Hall, Ashley Down, Bristol, for *Eclipse*, bay, foaled 1887, breeder unknown.
- 124 B. N. & H. C.—ROGER PALMER, Monkokehampton, for *King of the Forest*.

¹ Prizes given by the Plymouth Local Committee.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Class 18.—Pony Brood Mares and Foals, not exceeding 14 hands.
[3 entries, none absent.]

- 132 I. (£15.)—C. W. WILSON, Rigmaden Park, Westmoreland, for Snorer 2456, bay, foaled 1879 [foal by Sir George 778]; s. Sir George 778, d. The Pet.
131 II. (£10.)—JOHN WILLIAMS, Scorrier Ho., Cornwall, for Lucy 898, bay, foaled 1884 [foal by Hotspur 2119]; s. Young Lifton, d. Kitty Trevillion 896 by Tresise's Goonhilly.

Class 19.—Pony Mares or Geldings, above 12 hands 2 inches, and not exceeding 14 hands.¹ [9 entries, 2 absent.]

- 137 I. (£15, & Champion, £20².)—WILLIAM POPE, Cannon House, Downham Market, for Magpie 228, black and white mare, foaled 1878, bred by the late C. C. Cooke, Litcham, Norfolk; s. Confidence 1743, d. Spot 827 by Premier.
139 II. (£8.)—MAJ.-GEN. F. S. TALBOT, Buckerell Lodge, Exeter, for Bance, bay mare, bred by Mr. Rowe, Tavistock; s. Southampton.
141 III. (£3.)—MAJOR H. BYRON WOODS, 9, Kobe Terrace, Mutley, Plymouth, for Belle, dun mare, foaled 1883, breeder unknown.

Class 20.—Pony Mares or Geldings, not exceeding 12 hands 2 inches.¹
[8 entries, 1 absent.]

- 148 I. (£10, & R. N. for Champion².)—J. W. WESTAWAY, Burnford Farm, Mary Tavy, Devon, for Bantam, bay gelding, foaled 1886; s. Toby, d. Queen of the Moor.
149 II. (£6.)—MRS. WOWNACOTT, Brentnor, Bridestowe, Devon, for Flirt, grey mare, foaled 1881, bred by John Bolt, Tavistock; s. Hereford.
146 III. (£3.)—ERNEST HALL, Airdale, Elm Grove, Southsea, for Black Jack, brown gelding, age and breeder unknown.
142 R. N. & H. C.—G. H. G. ARDEN, Southam, Heavitree, Devon, for Princess.

Dartmoor Ponies.³ (Not exceeding 13 hands 2 inches.)

Class 21.—Dartmoor Stallions, foaled before Jan. 1, 1888.
[4 entries, none absent.]

- 151 I. (£8.)—F. H. FIRTH, Cator Court, Ashburton, for King of the Forest, grey, foaled 1882, bred by O. Caunter, Bachelor Hall Farm, Princetown.
153 II. (£4.)—R. PROUT, North Filham, Ughborough, Ivybridge, for Tommy, bay, foaled 1884.
150 R. N. & H. C.—DIRECTORS OF CONVICT PRISONS, for Mountain Hero.

Class 22.—Dartmoor Mares in foal, or with foals at foot.
[4 entries, none absent.]

- 157 I. (£8.)—J. W. WESTAWAY, Burnford Farm, Mary Tavy, Devon, for Queen of the Moor, black, foaled 1881.
156 II. (£4.)—C. T. FORD, Oakhay, Stoke Canon, Exeter, for Bijou, bay, foaled 1884, bred by Lady Torrens, Holne Cottage, Devon.
154 R. N. & H. C.—G. H. G. ARDEN, Southam, Heavitree, Exeter, for Jessie.

¹ Prizes given by the Plymouth Local Committee.

² Given by the Plymouth Local Committee for best Pony in Classes 19, 20, 21, and 22, suitable for riding purposes.

³ Prizes given by the Devon County Agricultural Association

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Class 23.—Dartmoor Mares or Geldings (to be ridden).

[9 entries, none absent.]

- 159 I. (£6.)—J. H. DEACON, Hoo Meavy, Yelverton, Devon, for *Miracle*, black gelding, foaled 1884, bred by J. Hamlyn, Buckfastleigh, Devon; s. Sentinel.
- 165 II. (£4.)—W. MUTTON, Five Lanes, Launceston, for *Little Star*, brown, foaled 1886.
- 166 B. N. & H. C.—JOHN PETHICK, Norley House, Plymouth, for *Prudence*.

Exmoor Ponies.¹ (Not exceeding 13 hands 2 inches.)

Class 24.—Exmoor Stallions, foaled before Jan. 1, 1888. [1 entry.]

- 167 I. (£8.)—DIRECTORS OF CONVICT PRISONS, Princetown, for *Katerfelto*, bay, foaled 1880, bred by F. Smyth, Wistland Pound, Barnstaple; s. John Trot.

Class 25.—Exmoor Mares in foal, or with foals at foot. [1 entry.]

- 168 I. (£8.)—JOHN ASHLEY, Honiton, for *Fan*, chestnut, foaled 1885, bred by Mr. Vincent, Bishop's Wood, Som.

Class 26.—Exmoor Mares or Geldings (to be ridden). [3 entries.]

- 170 I. (£6.)—JOHN PETHICK, Norley Ho., Plymouth, for *Queen Bee*, grey mare, foaled 1884, bred by R. Knight, Holt Ball, Luccombe; s. The Squire.
- 169 II. (£4.)—REV. M. J. MILLING, Ashton Kaynes, Cricklade, for *Charlie*, chestnut gelding, foaled 1885, breeder unknown; s. Royal George.
- 171 B. N.—E. R. B. TORR, Westleigh House, Bideford, for *Little Dick*.

Shires.

Class 27.—Shire Stallions, foaled in 1887. [12 entries, 2 absent.]

- 172 I. (£20, & Champion, £25.)—W. ARKWRIGHT, Sutton Scarsdale, Chesterfield, for *Marmion* II. 9885, brown, bred by A. B. Freeman-Mitford, C.B.; s. Harold 3703, d. Lockington Beauty by Champion 457.
- 173 II. (£10.)—P. ALBERT MUNTZ, M.P., Dunsmore, Rugby, for *Cameronian* 6895, brown, bred by H. E. Cameron, Newton Leys, Ashbourne; s. Corsair 3572, d. Carouse by Merry Boy 1547.
- 174 III. (£5.)—WALTER GILBEY, Elsenham Hall, Essex, for *Warrior Duke* 8536, bay, bred by J. F. Hollingworth, Weston-on-Trent; s. Duke of Hitchin 3063, d. Mettle by Warrior 2245.
- 181 B. N. & H. C.—W. R. TROTTER, for Willington Boy 8606.

Class 28.—Shire Stallions, foaled in 1888. [9 entries, none absent.]

- 187 I. (£20, & B. N. for Champion.)—LORD HINDLIP, Hindlip, Worcester, for *Hindlip Champion* 9584, black, bred by F. B. Champion, Heather, Ashby-de-la-Zouch; s. Harold 3703, d. Darling by Simon Pure 2018.
- 185 II. (£10.)—JAMES FORSHAW, Carlton-on-Trent, Newark, for *Echo's Victor* (late Naseby Victor 10037), bay, bred by George Kay, Chipping, Preston; s. Blyth Echo 2991, d. Polly by Black Prince 176.

¹ Prizes given by the Devon County Agricultural Association.

² Given by the Shire Horse Society for the best Shire Stallion.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 189 III. (£5.)—W. B. LONGTON, Cronton Hall, Lancs., for Cronton *Magna Charta* 9165, bay, bred by James Hemmant, Sutton St. Edmund's, Wisbech; s. King John 4502, d. by Matchless Wonder 2622.
- 191 H. C.—P. ALBERT MUNTZ, M.P., for Headon Black Knight 9530.

Class 29.—Shire Stallions, foaled in 1889. [12 entries, 3 absent.]

- 204 I. (£30.)—JOHN ROWELL, Manor Farm, Bury, Hunts., for Bury Victor Chief, black; s. Prince Victor 5287, d. Bury Daisy by Chatteris Le Bon 3023.
- 193 II. (£10.)—W. ARKWRIGHT, Sutton Scarsdale, Derbyshire, for Scarsdale Rocket, black; s. Royal Spark 4659, d. Scarsdale Depper by Champion 419.
- 201 III. (£5.)—JOHN D. LANG, Knowle, Sidmouth, for Knowle Loyola, bay; s. Naughty Tom 2853, d. Whittingham Witch, by Thumper 2136.
- 199 B. N. & H. C.—WALTER GILBEY for Essex Don; s. Real Briton 4f41.
- H. C.—JAMES HAWKINS for No. 200, Romany Bye; P. ALBERT MUIZ, M.P., for No. 202, Dunsmore Chamer.
- 197 Com.—B. I. BUCKNELL for Holcombe Wonder.

Class 30.—Shire Mares and Foals. [2 entries, both absent.]

Class 31.—Shire Fillies, foaled in 1887. [2 entries.]

- 208 I. (£15, & B. N. for Champion.)—JOSEPH WAINWRIGHT, Bowden Hall, Chapel-en-le-Frith, for Western Primrose, chestnut, bred by R. Brade, Banks, Southport; s. Bar None 2388, d. Roxana by England's Wonder 761.
- 207 II. (£10.)—J. P. CROSS, Catthorpe Towers, Rugby, for Shilton, black, bred by Charles Dunning, Shilton, Coventry; s. Carlton Wedger 5697, d. Bonny by Brown George 323.

Class 32.—Shire Fillies, foaled in 1888. [9 entries, 1 absent.]

- 211 I. (£15, & Champion, £15.)—JAMES FORSHAW, Carlton-on-Trent, Newark, for Challenge (*late Merry Thought*), bay, bred by Henry Smith, Cropwell Butler; s. Bar None 2388, d. Merry Lass by Merry Lad 2626.
- 209 II. (£10.)—JAMES BLYTH, Wood House, Stanstead, Essex, for Moulton Fantastic, bay, bred by A. H. Clark, Moulton Eaugate, Spalding; s. Electric 3069, d. Fancy by Matchless Wonder 2622.
- 215 III. (£5.)—W. B. LONGTON, Cronton Hall, Lancs., for Calwich Gandy, chestnut, bred by J. T. Ardron, Syston, Leics.; s. Harold 3703; d. Blossom by Tory 2939.
- 217 B. N. & H. C.—W. H. PUNCHARD for Arcadia; s. The General 4734.
- 216 H. C.—P. A. MUNTZ, M.P., for Dunsmore Caution; s. Charlatan 3540.

Class 33.—Shire Fillies, foaled in 1889. [9 entries, 2 absent.]

- 218 I. (£15.)—W. ARKWRIGHT, Sutton Scarsdale, Derbyshire, for Scarsdale Sparkle, brown; s. Royal Spark 4659, d. Scarsdale Bonny by Lincolnshire Lad II. 1865.
- 221 II. (£10.)—LORD HINDLIP, Hindlip, Worcester, for Hindlip Lady, bay, bred by Exors. of Hon. E. Coke; s. All Here 4829, d. Comfy by Charter 274C.
- 224 III. (£5.)—JOHN PARNELL, Rugby, for Rokeby Rhoda, bay; s. Ruier III 6553, d. Bittesby by Gay Lad 3665.
- 222 B. N. & H. C.—J. P. KIDSTON, Nyn Park, Potter's Bar, for Lady Maud.

* Given by the Shire Horse Society for the best Shire Mare or Filly.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Clydesdales.

Class 34.—Clydesdale Stallions, foaled in 1887. [9 entries, 3 absent.]

233 I. (£20, & Champion, £25.)—ANDREW MONTGOMERY, Nether Hall, Castle Douglas, N.B., for Macara 7991, brown, bred by R. Earle, Ellerton, Yorks.; s. Macgregor 1487, d. Violet of Ellerton 5362 by Tam O'Shanter 851.

231 II. (£10.)—J. KILPATRICK, Craigie Mains, Ayrshire, for Prince of Kyle 7155, brown, bred by the late R. F. F. Campbell, M.P., Craigie, Ayr; s. Prince of Wales 673, d. Mysie 6024 by Darnley 222.

232 III. (£5.)—THE MARQUIS OF LONDONDERY, K.G., Seaham Hall, for Crusader 6650, bay, bred by the late Sir R. Loder, Bt.; s. King Briton 5105, d. Flora II. 6370 by Prince of the Forest 2354.

230 R. N. & H. C.—J. STEWART HODGSON for Young Merry Monarch 8407.

Class 35.—Clydesdale Stallions, foaled in 1888. [8 entries, 2 absent.]

241 I. (£20, & R. N. for Champion.)—ANDREW MONTGOMERY, Nether Hall, for Prince Darnley 8133, brown, bred by James McCaig, Barnuloch, N.B.; s. Prince of Wales 673, d. Lindsay of Barnuloch 7499 by Darnley 222.

240 II. (£10.)—THE MARQUIS OF LONDONDERY, K.G., Seaham Hall, for Lustre 7937, black; s. Castlereagh, d. Lucy 4752 by The Tifter 371.

239 III. (£5.)—WM. GRAHAM, Eden Grove, Kirkbythore, Penrith, for The MacGash 7997, bay, bred by R. and T. Sprout, Culdoch, Kirkcudbright; s. Macgregor 1487, d. Bowena 6770 by Druid 1120.

243 R. N. & H. C.—GEORGE RODGER, for The Magician 8333.

Class 36.—Clydesdale Mares and Foals. [3 entries, none absent.]

215 I. (£20.)—WM. GRAHAM, Eden Grove, Kirkbythore, Penrith, for Nettie, bay, foaled 1886 [foal by Lothian King 6985], bred by John Parker, Inch Parks, Stranraer, N.B.; s. Belted Knight 1395, d. Jean of Inch Parks 4945 by Lord Lyon 489.

246 II. (£10.)—THE MARQUIS OF LONDONDERY, K.G., Seaham Hall, for Edith 8670, bay, foaled 1885 [foal by Castlereagh], bred by the Keir Trustees, Dunblane; s. Young Lorne 997, d. Keir Kate V. 2408 by Newstead 559.

244 III. (£5.)—THOMAS CHAPMAN, Orchard Portman, Taunton, for Kirk lady 4485, bay, foaled 1879 [foal by Uncle Sam 8375]; s. Young Prince of Wales 1016, d. Kate 53 by Prince 609.

Class 37.—Clydesdale Fillies, foaled in 1887. [5 entries, 1 absent.]

261 I. (£15, & R. N. for Champion.)—R. S. SCOTT, Craigievar, Skelmorlie, N.B., for Scottish Boss, bay, bred by Trustees of late J. McClew, Dinvin, Portpatrick, N.B.; s. Darnley 222, d. Ethel Newcome 2599 by Clansman 150.

247 II. (£10.)—THE EARL OF CAWDOR, Stackpole Ct., Pembroke, for Bell brown, bred by A. McDowal, Harlaw, Balerno, N.B.; s. Obedience 2313, d. Maggie of Harlaw 5574 by Abbey Prince 2.

249 III. (£5.)—THE MARQUIS OF LONDONDERY, K.G., Seaham Hall, for Gladys, bay; s. Castlereagh, d. Gaiety 2477 by What Care I 912.

248 R. N. & H. C.—LORDS A. & L. CECIL, for Clara, bay; s. Claymore 3522.

Class 38.—Clydesdale Fillies, foaled in 1888. [11 entries, 3 absent.]

262 I. (£15, & Champion, £25.)—R. S. SCOTT, Craigievar, Skelmorlie, N.B., for Scottish Snowdrop, brown, bred by J. McCaig, Challock, Stranraer, N.B.; s. Prince of Wales 673, d. Duchess II. of Challock 7500 by Darnley 222.

* Given by the Clydesdale Horse Society for the best Clydesdale Stallion.

* Given by the Clydesdale Horse Society for the best Clydesdale Mare or Filly.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 51 II. (£10.)—THE EARL OF CAWDOR, Stackpole Ct., for Decreto, brown, bred by James Drew, Doonhill, Newton Stewart, N.B.; s. Flashwood 3604, d. Diana 7179 by Macgregor 1487.
- 255 III. (£5.)—THE EARL OF CAWDOR, for Silver Bell, bay; s. St. Govens 3527, d. Maid of the West 3380 by Star of the West 828.
- 259 R. N. & H. C.—THE MARQUIS OF LONDONDEERRY, K.G., for Doris.

Suffolks.

Class 39.—Suffolk Stallions, foaled in 1887. [8 entries, 1 absent.]

- 263 I. (£20.)—W. H. HEWITT, West Hill, Copdock, Ipswich, for The Osar 1754, chestnut, bred by W. Toller, Gedgrave, Suffolk; s. Verger 1550, d. Shelduck 943 by Standard Bearer 1207.
- 270 II. (£10.)—HORACE WOLTON, Newbourn Hall, Woodbridge, for Royalty II. 2015, chestnut, bred by H. P. Cross, Hemley, Suffolk; s. Diadem 1553, d. Moggy 241 by Royalty 1339.
- 266 III. (£5.)—A. J. SMITH, Rendlesham, Woodbridge, for Eulor 1786, chestnut, bred by Exors. of Thos. Roberts, Alderton; s. Checkmate 1566, d. Brag by Orford's Briton 916.
- 267 R. N. & H. C.—JAMES TOLLER, Blaxhall, Wickham Market, for Russet. Com.—B. A. POSFORD for No. 264, Chelsea; SIR R. WILMOT, Bt., for No. 268, Sandboy.

Class 40.—Suffolk Stallions, foaled in 1888. [17 entries, 3 absent.]

- 280 I. (£20.)—I. PRATT & SONS, Melton, Woodbridge, for Winston 1997, chestnut, bred by W. Long, Winston, Suffolk; s. Banker 1444, d. Scott 1985 by Tiptop 1367.
- 284 II. (£10.)—J. H. WEBSTER, Marden Deer Park, Caterham Valley, for Nottingham 1909, chestnut, bred by R. H. Wrinch, Harkstead, Ipswich; s. Chieftain 1354, d. Juno 1500 by Cupbearer III. 566.
- 286 III. (£5.)—WM. WILSON, Baylham Hall, Ipswich, for Banker's Delight 1979, chestnut, bred by H. Turner, Mickfield Hall, Suffolk; s. Wilson's Banker 1444, d. by Ball's Champion 51.
- 283 R. N. & H. C.—JAMES TOLLER, Blaxhall, Wickham Market, for Rainbow.
- 271 H. C.—MANFRED BIDDLE, Playford, Ipswich, for Boyton 2130. Com.—MANFRED BIDDLE, for No. 272, Lord Rochford; WM. BYFORD, for No. 273, Alderman; WM. EVERITT, for No. 274, Warrior; F. FITZ-HERBERT, for No. 275, Diomed; G. PETTIT, for No. 277, Friston; T. PETTIT, for No. 278, Windsor Captain; B. A. POSFORD, for No. 279, Dresden; A. J. SMITH, for No. 282, Congress; H. WOLTON, for No. 287, Diamond's Drednought.

Class 41.—Suffolk Stallions, foaled in 1889.¹ [9 entries, 2 absent.]

- 289 I. (£15.)—THE DUKE OF HAMILTON & BRANDON, K.T., chestnut, bred by Charles Barnes, Kettleburgh, Wickham Market; s. Wanderer 1463, d. by Wolton's Royalty 1339.
- 290 II. (£10.)—W. H. HEWITT, West Hill, Copdock, Ipswich, for Windsor Chieftain 2025, chestnut, bred by Robert Wrinch, Harkstead, Ipswich; s. Chieftain 1354, d. Juno 1500 by Cupbearer III. 566.

¹ The prizes in this class are given by the Suffolk Stud Book Association.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 292 **R. N. & H. C.**—**B. A. POSFORD**, Falkenham, for *Wedgewood II.* 2048.
H. C.—**G. PETTIT**, for No. 291, *Rover*; **B. A. POSFORD**, for No. 293, *Lowestoft*.

Class 42.—Suffolk Mares and Foals. [6 entries, 1 absent.]

- 297 **I. (£20).**—**THE DUKE OF HAMILTON & BRANDON, K.T.**, for *Queen of Diamonds* 1859, chestnut, foaled 1883 [foal *by* *Wellington* 1715], bred by *T. Hayward, Ringshall*; *s. Vanguard* 1327, *d. by* *Suffolk Emperor* 618.
 299 **II. (£10).**—**J. HUME WEBSTER**, Marden Deer Park, Caterham Valley, for *Mettle* 2094, chestnut, foaled 1886 [foal *by* *Donny* 1618], bred by *W. Byford, The Court, Glemsford*; *s. Jumbo* 1417, *d. Barnmaid* 143 *by* *Active* 230.
 302 **III. (£5).**—**H. WOLTON**, Newbourn Hall, Woodbridge, for *Pearl* 1621, chestnut, foaled 1881 [foal *by* *Chieftain* 1354]; *s. Prince Royal* 1338, *d. Ruby of Newbourn* 1053 *by* *Monarch* 1348.
 300 **R. N. & H. C.**—**J. H. WEBSTER** for *Eva* 2001, chestnut; *s. Cupbearer* III.
 301 **H. C.**—**WM. WILSON**, Baylham Hall, Ipswich, for *Baylham Belle* 2233.

Class 43.—Suffolk Fillies, foaled in 1887. [6 entries, 1 absent.]

- 308 **I. (£15).**—**J. HUME WEBSTER**, Marden Deer Park, Caterham Valley, for *Queen of Hearts* 2166, chestnut, bred by *C. Austin, Brandeston, Wickham Market*; *s. Cupbearer* III. 566; *d. Queen of Diamonds* 1859 *by* *Vanguard* 1327.
 307 **II. (£10).**—**A. J. SMITH**, Rendlesham, Suffolk, for *Grecian Bend* 2672, chestnut, bred by the late *T. W. Grimwood, Woodbridge*; *s. Diadem*, 1553, *d. Diamond* 409 *by* *Young Emperor* 645.
 306 **III. (£5).**—**THE DUKE OF HAMILTON & BRANDON, K.T.**, for *Sprightly* 2720, chestnut, bred by *D. Smith, Parham, Wickham Market*; *s. Wanderer* 1463, *d. Sprite* 1862 *by* *Statesman* 657.
 305 **R. N. & H. C.**—**THE DUKE OF HAMILTON & BRANDON, K.T.**, for *Easton Belle*.
 303 **H. C.**—**W. BYFORD**, Glemsford, Suffolk, for *Madam* 2064.

Class 44.—Suffolk Fillies, foaled in 1888. [4 entries, none absent.]

- 312 **I. (£15).**—**JAMES TOLLER**, Blaxhall, Wickham Market, for *Violet* 2453, chestnut; *s. Wantisden Duke* 534, *d. Virtue* 1597 *by* *Cupbearer* III. 566.
 309 **II. (£10).**—**THE DUKE OF HAMILTON & BRANDON, K.T.**, for *Belle* 2500, chestnut; *s. Wanderer* 1463, *d. P. B.* 1517 *by* *Statesman* 657.
 310 **R. N. & H. C.**—**THE HON. W. LOWTHER, M.P.**, for *Butterfly* 2465.
 311 **H. C.**—**A. J. SMITH**, Rendlesham, Woodbridge, for *Fairy* 2333.

Class 45.—Suffolk Fillies, foaled in 1889.¹ [6 entries, 1 absent.]

- 316 **I. (£15).**—**J. HUME WEBSTER**, Marden Deer Park, Caterham Valley, for *The Miller's Daughter* 2608, chestnut, bred by *M. Biddell, Playford, Ipswich*; *s. Sultan* 1727, *d. Miller* 1183 *by* *Colonel Snap* 1432.
 318 **II. (£10).**—**H. WOLTON**, Newbourn Hall, Woodbridge, for *Smart* 2646, chestnut, bred by *W. Hunt, Culpho, Suffolk*; *s. Condor* 1483, *d. Smart* 509 *by* *Conqueror* 78.
 314 **R. N.**—**A. J. SMITH** for *Damsel* 2848; *s. Prince of May* 1586.
 313 **H. C.**—**W. BYFORD**, Glemsford, for *Medal* 2704; *s. Jumbo* 1417.
 317 **Com.**—**J. HUME WEBSTER** for *Eugenie* 2617; *s. Dreadnought* 1462.

¹ The Prizes in this Class are given by the Suffolk Stud Book Association.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Agricultural Horses.¹

Class 46.—Agricultural Stallions, foaled before 1888.

[2 entries, none absent.]

320 I. (£15.)—YEO BROS., Mount Pleasant, Plymouth, for Sweet William, bay foaled 1886, bred by W. Fowler, Bodmin; s. Brown Sherry, d. by Albion.

Class 47.—Agricultural Mares or Geldings, foaled in or after 1884.

[7 entries, none absent.]

327 I. (15.)—JOHN WILLS, Berry Barton, Totnes, for Wallace, grey gelding, foaled 1884, bred by Mr. Woolgrove, Banbury.

326 II. (£10.)—WM. TREVENA, Barley House Estate, Plymouth, for Tiger, black gelding, foaled 1884, breeder unknown.

322 B. N.—J. DUNSTAN, Sparnock, Truro, for Beauty, s. Draman Junior.

323 Com.—F. T. GLOYN, Deer Park Farm, Egg Buckland, Devon, for Duke.

Class 48.—Pair of Draught Mares or Geldings, suitable for agricultural purposes in Devon and Cornwall. [1 entry.]

328 I. (£15.)—JOHN PETHICK, Norley House, Plymouth, for Poppet and Lion, bays, foaled 1873, breeders unknown.

CATTLE.

Shorthorns.

Class 49.—Shorthorn Bulls, calved in 1884, 1885, 1886, or 1887.

[7 entries, 1 absent.]

334 I. (£20, & R. H. for Champion.)—J. DEANE WILLS, Bapton Manor, Codford, Wilts., for Challenge Cup 57029, roan, born Nov. 17, 1887, bred by W. Duthie, Tarnes; s. Cupbearer 52692, d. Bright Belle by Leon 49860.

329 II. (£10.)—A. E. W. DARBY, Little Ness, Shrewsbury, for Proconsul Pippin 56360, roan, born Aug. 2, 1887, bred by J. Houlton, Ladbarrow, Glos.; s. Prince Frogmore's Seal 48488, d. Probus Pippin by Earl of Probus 46307.

330 III. (£5.)—J. C. DAUBUZ, Killiow, Truro, for Crown Prince 57127, white, born Jan. 24, 1887; s. Lord Iddesleigh 57633, d. Ruth 182nd by Miriam's Heir 45251.

335 B. H. & H. C.—J. D. WILLIS for Hercules 54424; s. Clear the Way.

Class 50.—Shorthorn Bulls, born in 1888. [11 entries, 2 absent.]

336 I. (£20, & Champion, £25.)—HER MAJESTY THE QUEEN, for New Year's Gift 57796, roan, born Jan. 1, bred by Lord Lovat, Beaufort Castle, N.B.; s. Bannockburn 49035, d. Louisa by Duke of Beaufort 38122.

346 II. (£10.)—T. WILLIS, Manor House, Carperby, Yks., for Prince Rupert 57942, roan, born March 11; s. Royalist 52042, d. Rose of Summer by Major Windsor 34789.

¹ Prizes given by the Plymouth Local Committee.

² Given by the Shorthorn Society for the best Male Shorthorn.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 342 III. (£5).—T. F. ROSKEUGE, Trenethick, Helston, for Bob Roy, roan, born Apr. 12; s. Trenethick 56660, d. Ruth 58thA by Viscount Trehane 50611.
 341 R. N. & H. C.—LORD POLWARTH for Flag of Truce; s. Sir Arthur Irwin.
 343 Com.—J. DEANE WILLIS for Sir Douglas; s. Laberius 54523.

Class 51.—Shorthorn Bulls, born in 1889. [17 entries, none absent.]

- 363 I. (£20).—J. D. WILLIS, Bapton Manor, Codford, Wilts, for Count Lavender, roan, born March 3, bred by W. Duthie, Tarves, N.B.; s. Norseman 56233, d. Sweet Lavender by Earl of March 33807.
 361 II. (£10).—W. TRETHEWY, Tregoose, Grampound Road, for Pol, red and little white, born Feb. 15; s. David Mowbray 55555, d. Ruth 205th by Star of Britain 48786.
 351 III. (£5).—H.R.H. THE PRINCE OF WALES, K.G., for Lord Fauntleroy, roan, born April 6; s. Baron Wolferton 44387, d. Lady Flora by Sir Simeon 42412.
 357 R. N. & H. C.—THE DUKE OF NORTHUMBERLAND for Royal Rover.
 H. C.—HER MAJESTY THE QUEEN for No. 349, Stanley; LORD POLWARTH for No. 358, Windsor Royal.
 Com.—HER MAJESTY THE QUEEN for No. 347, Napoleon; C. W. BRIERLEY for No. 354, Viscount Knightley; H. J. SHELTON for No. 360, Duke of Brailles 15th.

Class 52.—Shorthorn Cows or Heifers (in-milk or in-calf), calved before or in 1887. [6 entries, 1 absent.]

- 368 I. (£20, & Champion, £25.)—ROBERT THOMPSON, Inglewood, Penrith, for Molly Millicent, roan, born June 11, 1884, calved Jan. 19, 1890; s. Beau Benedict 42769, d. Fair Millicent 2nd by Brilliant Butterfly 36270.
 364 II. (£10).—C. W. BRIERLEY, Rosedale, Tenbury, for Marchioness of Waterloo 6th, roan, born Aug. 21, 1886, calved Nov. 29, 1889, bred by W. H. Tremaine, Sherborne, Northleach; s. Earl of Oxford 51185, d. Marchioness of Waterloo 1st by Duke of Waterloo 3rd 23801.
 369 III. (£5).—ROBT. THOMPSON, for Inglewood Gem, roan, born Sept. 14, 1885, calved Dec. 31, 1889; s. Royal Baron 50354, d. Inglewood Belle by Beau Benedict 42769.
 366 R. N. & H. C.—LORD POLWARTH for Wave of Loch Leven.
 365 H. C.—A. S. GIBSON, Springhill, Notts., for Countess Farewell.

Class 53.—Shorthorn Heifers, calved in 1888. [11 entries, 1 absent.]

- 378 I. (£15, & R. N. for Champion.)—LORD POLWARTH, Mertoun House, St. Boswells, N.B., for Truth, red and white, born April 12; s. Sir Arthur Irwin 44016, d. Timbrel by Prince Stuart 45421.
 377 II. (£10).—THE DUKE OF NORTHUMBERLAND for Fairy Rosebud, roan, born Mar. 29; s. King Hal 49808, d. Studley Rosebud by Royal Studley 45548.
 371 III. (£5).—C. W. BRIERLEY, Rosedale, Tenbury, for Grace Darling, roan, born Oct. 22, bred by Richard Stratton; s. Signet 55037, d. Grace Gazelle by Rowfant Duke of Oxford 43926.
 379 R. N. & H. C.—ROBERT THOMPSON for Windsor's Beauty; s. Model 53322.

* Given by the Shorthorn Society for the best Female Shorthorn.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 370 H.C.—HER MAJESTY THE QUEEN for Empress; s. Field Marshal 47870. Com.—LORD FITZHARDINGE for No. 373, Waterloo 52nd; SIDNEY HILL for No. 374, Flora 2nd; THE DUKE OF NORTHUMBERLAND for No. 376, Woodland Daisy.

Class 54.—Shorthorn Heifers, calved in 1889. [15 entries, 2 absent.]

- 381 I. (£15.)—HER MAJESTY THE QUEEN for Rosalind, roan, born Feb. 12; s. Field-Marshal 47870, d. Ruth 201st by Star of Britain 48786.
 385 II. (£10.)—WM. HOSKEN & SON, Loggans Mill, Hayle, for Lady Blithfield 6th roan, born April 13, s. Duke of Oxford 70th 51141, d. Lady Blithfield 2nd by Cherry Duke 11th 42918.
 395 III. (£5.)—J. D. WILLIS, Bapton Manor, Codford, Wilts, for Lady Madge, red, born March 22, bred by William Duthie, Tarves, N.B.; s. Norseman 56233, d. Lady Marjory 3rd by Field-Marshal 47870.
 382 R. N. & H. C.—C. W. BRYERLEY for Rosedale Empress.
 H. C.—R. & G. HARRISON for No. 384, Rosemary; WM. HOSKEN & SON for No. 386, Carnation 13th; LORD POLWARTH for No. 390, Gladsome Wave; R. THOMPSON for No. 393, Merry Millicent.
 388 Com.—W. F. INGE, for Gipsy Queen.

Herefords.

Class 55.—Hereford Bulls, calved in 1884, 1885, 1886, or 1887.

[5 entries, 1 absent.]

- 396 I. (£20.)—THE EARL OF COVENTRY for Rare Sovereign 10499, born Feb. 19, 1884; s. Good Boy 7668, d. Rare Jewel by Merry Monarch 5466.
 400 II. (£10.)—JOHN PRICE, Court Ho., Pembridge, for Radnor Boy, born April 24, 1884, bred by T. Robinson, Lynhales, Kingston; s. Highland Laird 7015, d. Prettymaid 2nd by Horatius 2nd 5983.
 399 III. (£5.)—RALPH PALMER, Lodge Farm, Nazeing, Essex, for Bombar-dier 12869, born July 2, 1887; s. Rose Stock 6651, d. Lillian by Rodney 4907.
 398 R. N. & H. C.—R. S. OLVER, Trescowe, Bodmin, for Mount's Bay 13275.

Class 56.—Hereford Bulls, calved in 1888. [8 entries, 1 absent.]

- 403 I. (£20.)—W. H. COOKE, The Green, Shelsley Kings, Worcester, for Grove Wilton 4th 13846, born March 12; s. Grove Wilton 3rd 11295, d. Leinthall Symmetry by Downton Grand Duke 5898.
 406 II. (£10.)—A. E. HUGHES, Wintercott, Leominster, for Endale 13773, born Jan. 30, bred by E. Yeld, Endale, Leominster; s. Hilarity 8734, d. Fraulein Wilton by Lord Wilton 4740.
 402 III. (£5.)—J. H. ARKWRIGHT, Hampton Court, Leominster, for Spring Jack 14191, born Jan. 2; s. Hilarity 8734, d. Lively 10th by Conjuror 5264.
 407 R. N. & H. C.—H. F. RUSSELL, Westonbury, Pembridge, for Sir Frank.

Class 57.—Hereford Bulls, calved in 1889. [19 entries, 4 absent.]

- 417 I. (£20.)—JOHN PRICE, Court House, Pembridge, for Statesman, born Jan. 25; s. Monarch 7858, d. Snowdrop by Hardwick 5956.
 426 II. (£10.)—H. W. TAYLOR, Showle Court, Ledbury, for Lord Tredegar (vol. xxi.), born Jan. 31; s. Victorious 11820, d. Wintercott 10th by Franklin 6961.
 419 III. (£5.)—JAMES RANKIN, M.P., Bryngwyn, Tram Inn, for Senator (vol. xxi.) born Jan. 9; s. Gerald 12152, d. Sunflower by Spartan 5008.

cxxxviii Award of Live-Stock Prizes at Plymouth.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 413 **R. N. & H. C.**—A. E. HUGHES, Wintercoft, Leominster, for Ironclad.
 411 **H. C.**—J. H. ARKRIGHT for Rose Cross 2nd.
 Com.—JAMES RANKIN, M.P., for No. 418, Vincent; S. ROBINSON for No. 423, Sterling; H. F. RUSSELL, for No. 424, Lord Level.

Class 58.—Hereford Cows or Heifers (in-milk or in-calf,) calved before or in 1887. [6 entries, 3 absent.]

- 429 **I. (£20.)**—THE EARL OF COVENTRY, Croome Court, Worcester, for Rosewater, born Feb. 27, 1886; s. Rare Sovereign 10499, d. Rosemary by Grove 3rd 5051.
 430 **II. (£10.)**—THE EARL OF COVENTRY for Ladywood, born Jan. 2, 1887, calved Feb. 2, 1890; s. Adelbert 8185, d. Lady Spencer by Monkton Lad 5646.
 433 **III. (£5.)**—THOS. FENN, Stonebrook House, Ludlow, for Bravura (vol. xviii. p. 281), born May 17, 1886, calved Feb. 28, 1890, bred by the Earl of Coventry; s. Good Boy 7668, d. Bertha by Commander 4452.

Class 59.—Hereford Heifers, calved in 1888. [9 entries, 2 absent.]

- 438 **I. (£15.)**—THOS. FENN, Stonebrook House, Ludlow, for Downton Fancy (vol. xx. p. 315), born Jan. 9; s. Bourton 11005, d. Lady Buttercup by Moonraker 3rd 6077.
 437 **II. (£10.)**—R. EDWARDS, The Sheriffs, Kington, for Sheriff's Sunlight (vol. xx.), born Jan. 6; s. Magnet 8873, d. Sparkle by King of the Lilies 3892.
 439 **III. (£5.)**—THOMAS FENN for Windsor Belle (vol. xx. p. 315), born Feb. 20; s. Bourton 1005, d. Longhorn by Longsides 5434.
 441 **R. N. & H. C.**—JOHN PRICE, Pembridge, for Lady Constance, s. Monarch.
 434 **Com.**—HER MAJESTY THE QUEEN for Rose; s. Auctioneer 5194.

Class 60.—Hereford Heifers, calved in 1889. [19 entries, 3 absent.]

- 450 **I. (£15.)**—H. HAYWOOD, Blakemere H., Hereford, for Promise (vol. xxi.), born March 20; s. Derrock 12062, d. Primrose by Honeywood 5741.
 448 **II. (£10.)**—RICHARD GREEN, The Whittern, Kington, for Diana (vol. xxi.), born Apr. 1; s. Whittern Grove 10843, d. Duchess 5th by Corsair 5271.
 455 **III. (£5.)**—JOHN PRICE, Court House, Pembridge, for Silvia, born Feb. 20; s. Sir Garnet 10634, d. Sissie by Monarch 7858.
 449 **R. N. & H. C.**—RICHARD GREEN for Sunbeam; s. Washington 2nd 11834.
 445 **H. C.**—THE EARL OF COVENTRY for Golden Fleece; s. Rare Sovereign 10499.
 Com.—RALPH PALMER for No. 451 Kolyoly; JOHN PRICE for No. 456, Princess Maud; S. ROBINSON for No. 457, Mermaid 10th; A. E. T. SAVORY for No. 459, Miss Luna.

Devons.

Class 61.—Devon Bulls, calved in 1884, 1885, 1886, or 1887. [7 entries, none absent.]

- 468 **I. (£20.)**—J. C. WILLIAMS, Werrington Park, Cornwall, for Marmaduke 2280, born Nov. 21, 1885, bred by W. Ferry, Lobhill, Lew Down; s. Bravo 1686, d. Mouse 8791 by Druid 1817.
 462 **II. (£10.)**—RICHARD BICKLE, Bradstone Hall, Tavistock, for Fancy's Robin 2nd 1966, born March 28, 1886; s. Gladstone 1737, d. Fancy 5297 by Stockley Prince 1454.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 467 III. (£5.)—W. H. PUNCHARD, Bourton Hall, Totnes, for The Vicar 2156, born Jan. 16, 1886, bred by J. Howse, Stamborough, Washford, Somerset; s. Druid 1817, d. Lily 6th 5479 by Young Profit's Duke.
- 465 R. N. & H. C.—J. F. R. MORRIS, for Primrose's Duke 2296.
Com.—J. FARTHING for No. 463, Robin Hood; J. HOWSE, for No. 464, Shamrock; W. S. PERRY for No. 466, Bondholder.

Class 62.—Hereford Bulls, calved in 1888. [10 entries, none absent.]

- 471 I. (£20.)—VISCOUNT PORTMAN, Bryanston, Dorset, for Royal Windsor 2665, born May 3, bred by the Hon. C. B. Portman, Child Okeford; s. Eclipse 1728, d. Hanford 2nd by Love Apple.
- 472 II. (£10.)—W. H. PUNCHARD, Bourton Hall, Totnes, for Duke of Bourton (late Curlew 2376), born June 21, bred by Sir W. R. Williams, Bt.; s. Foreman 1968, d. Lady Currypool 5430 by Profit's Duke 1194.
- 469 III. (£5.)—RICHARD BICKLE, Bradstone Hall, Devon, for Champion 2nd 2356, born May 19; s. Champion 1696, d. Crafty 2nd 7414 by Narcissus 1617.
- 474 R. N. & H. C.—WM. TUCKER, Monkleigh, Devon, for Daisy's Duke 2378.
- 476 H. C.—J. C. WILLIAMS, Werrington Park, Cornwall, for Defence 2380.

Class 63.—Devon Bulls, calved in 1889. [12 entries, 2 absent.]

- 487 I. (£20.)—JOHN TREMAYNE, Sydenham, Lew Down, Devon, for Lovely Laddie, born March 8; s. Bravo 1686, d. Lovely Lady 7247 by Sir Michael.
- 485 II. (£10.)—ALFRED C. SKINNER, Pound Farm, Bishops Lydeard, for Fancy's Gordon (vol. xiii.), born Feb. 4; s. General Gordon 1974, d. Fancy 7th 8991 by Lord Currypool 1589.
- 479 III. (£5.)—RICHARD BICKLE, Bradstone Hall, Devon, for The Count, born Jan. 15; s. Champion 1696, d. Countess 2nd 5523 by Narcissus 1617.
- 489 R. N. & H. C.—JOHN TREMAYNE for Bravo-Tempter; s. Bravo 1686.
H. C.—CHARLES MENHENICK for No. 483, Victor; JOHN TREMAYNE for No. 488, Bravo-Tempter 2nd.

Class 64.—Devon Cows or Heifers (in-milk or in-calf), calved before or in 1887. [6 entries, 1 absent.]

- 496 I. (£20.)—SIR WM. WILLIAMS, Bt., Heanton, Devon, for Flower 2nd 9355, born June 2, 1886; s. Eclipse 1728, d. Flower 8th by Young Palmerston.
- 494 II. (£10.)—E. J. STANLEY, M.P., Quantock Lodge, Bridgwater, for Moss Rose 11th, born Apr. 10, 1887; s. Royal Sam 2122, d. Moss Rose 10th 7109 by General Colley 1564.
- 493 III. (£5.)—ALFRED C. SKINNER, Pound Farm, Bishops Lydeard, for Duchess 17th 8988, born June 14, 1886; s. Lord Currypool 1589, d. Duchess 7th 5260 by Duke of Farrington 1323.
- 495 R. N. & H. C.—SIR WM. WILLIAMS, Bt., for Flame 3rd 9932; s. Eclipse 1728.
- 491 H. C.—W. H. PUNCHARD for Lady Bourton 19932 (late Foam 3rd 9934).

Class 65.—Devon Heifers, calved in 1888. [7 entries, none absent.]

- 501 I. (£15.)—ALFRED C. SKINNER, Pound Farm, Bishops Lydeard, for Rosebud 10447, born Feb. 9; s. General Gordon 1974, d. Moss Rose 8th 7017 by Lord Stowey 1601.
- 500 II. (£10.)—W. H. PUNCHARD, Bourton Hall, Totnes, for Lady Jane 10373, born May 20, bred by R. Bickle; s. Champion 1696, d. Lady Julia 7432.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 497 **III. (£5).**—RICHARD BICKLE, Bradstone Hall, Devon, for Queen 5th 9987, born June 3; s. Gladstone 1737, d. Queen 3rd 5969 by Narcissus 1617.
503 **R. N. & H. C.**—SIR WM. WILLIAMS, Bt., for Friendly 3rd 10517.
499 **H. C.**—J. NORMAN, Horwood Barton, Devon, for Picture 3rd.

Class 66.—*Devon Heifers, calved in 1889.* [12 entries, none absent.]

- 514 **I. (£15).**—SIR WM. WILLIAMS, Bt., Heanton, Barnstaple, for Fiction 2nd, born April 9; s. Foreman 2nd 1969, d. Fiction by Duke of Flitton 17th.
513 **II. (£10).**—ALFRED C. SKINNER, Pound Farm, Bishops Lydeard, for Lady Passmore 7th (vol. xiii.), born May 21; s. General Gordon 1974, d. Lady Passmore 3rd 7013 by Lord Stowey 1601.
506 **III. (£5).**—JOHN FARTHING, Currypool, Bridgwater, for Robin's Duchess 9th 10729, born May 16; s. Duke of Wellington 1955, d. Robin's Duchess 3rd 6293 by Royal Duke 1640.
511 **R. N. & H. C.**—W. H. PUNCHARD for Magnolia 10935; s. Whitehall 2175.
H. C.—JOHN HOWSE for No. 507, Cowslip 2nd; A. C. SKINNER for No. 512, Rosebud 2nd.

South Devons (Hams).¹

Class 67.—*S. Devon Bulls, calved 1884, 1885, 1886, or 1887.*

[7 entries, none absent.]

- 517 **I. (£15).**—A. J. COAKER, Charleton Court, Kingsbridge, for Prince, born in March, 1886; s. Prince Imperial, d. Saffron.
520 **II. (£10).**—H. B. MILDWAY, Flete, Holbeton, for Merry Monarch, born July 12, 1886, bred by John Bulteel; s. Monarch, d. Marigold.
516 **III. (£5).**—JOHN BULTEEL, Pamflete, Ivybridge, for Raglan, born Apr. 17, 1887, bred by H. B. Mildmay; s. Rubens, d. Restless.
521 **R. N. & H. C.**—LORD REVELSTOKE, Membland, for bull born Nov. 5, 1887.
H. C.—B. W. COAKER for No. 518, Gem; H. P. HODGE for No. 519, Beaconsfield; JAMES STOKES for No. 522, Lorne.

Class 68.—*S. Devon Bulls, calved in 1888.* [6 entries, none absent.]

- 523 **I. (£15).**—MRS. ANDREWS, Ley, North Huish, Ivybridge, for Sir Garnet, born February 14; s. Squire, d. Dandy by British King.
524 **II. (£10).**—A. J. COAKER, Charleton Court, Kingsbridge, for Major, born in December; s. Prince Imperial, d. Daisy.
525 **III. (£5).**—F. W. COAKER, Stokenham, Kingsbridge, for Master Harry, born January 7; s. Victor, d. Beauty by Master Tommy.
526 **R. N. & H. C.**—J. D. ELLIS, Dunstone Farm, Yealmpton, for Vulcan.

Class 69.—*S. Devon Bulls, calved in 1889.* [5 entries, none absent.]

- 529 **I. (£10).**—MRS. ANDREWS, Ley, North Huish, Ivybridge, for Punch, born January 18; s. Prince, d. Cherry by Garfield.
530 **II. (£5).**—A. J. COAKER, Charleton Court, Kingsbridge, for General, born in June; s. Model, d. Lily.
533 **III. (£3).**—J. W. MEATHERELL, Caulston Barton, Newton Ferrers, Devon, for Forester 4th, born May 8; s. Forester 3rd, d. Fancy by Famous.
532 **R. N. & H. C.**—JOHN S. FORD, Hall Torrs, Yealmpton, for Sir Garnet 2nd.

¹ Prizes given by the Devon County Agricultural Association.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Class 70.—*S. Devon Cows or Heifers (in-milk or in-calf), born before or in 1887.* [8 entries, 1 absent.]

538 I. (£15.)—JOHN S. FORD, Hall Torrs, Yealmpton, Devon, for Lily 2nd, born February 20, 1886; s. Baron, d. Lily by Napoleon.

539 II. (£10.)—W. H. PAIN, Kingsbridge, for Cherry 4th, born Aug. 24, 1884, bred by H. Pain & Son, Kingsbridge; s. Marquis, d. Cherry by Napoleon.

535 III. (£5.)—F. W. COAKER, Stokenham, Kingsbridge, for Cheerful 2nd, born April 2, 1884, calved March 24, 1890; s. Master Tommy, d. Cheerful 1st by Master Charlie.

537 R. N. & H. C.—JOHN S. FORD, Hall Torrs, Yealmpton, for Handsome.

Class 71.—*S. Devon Heifers, calved in 1888.* [3 entries, none absent.]

542 I. (£10.)—JOHN S. FORD, Hall Torrs, Yealmpton, Devon, for Dandy 2nd, born May 9; s. Sir Garnet, d. Dandy by Brilliant.

543 II. (£5.)—W. H. PAIN, Kingsbridge, for Cherry, born April 12, bred by H. Pain & Son, Kingsbridge; s. Nelson, d. Cherry 5th by Prince Imperial.

544 R. N.—LORD REVELSTOCK for heifer born November 13.

Class 72.—*S. Devon Heifers, calved in 1889.* [5 entries, none absent.]

547 I. (£10.)—JOHN S. FORD, Hall Torrs, Yealmpton, Devon, for Duchess, born January 21; s. Baron, d. Primrose by Brilliant.

548 II. (£5.)—JOHN S. FORD for Beauty, born May 18; s. Baron, d. Countess by Brilliant.

549 III. (£3.)—W. H. PAIN, High Ho., Kingsbridge, for Duchess 3rd, born January 21; s. Nelson, d. Duchess 2nd by Hernalford.

545 R. N. & H. C.—B. W. COAKER, Old Newnham, Plympton, for Pretty.

Sussex.

Class 73.—*Sussex Bulls, calved in 1885, 1886, or 1887.*

[5 entries, none absent.]

552 I. (£20.)—LOUIS HUTH, Possingworth Manor, Waldron, for Lord Beckley 6th 700, born March 28th, 1885; s. Lord Beckley 2nd 613, d. Lilly 2nd 2882 by Sir Roger.

551 II. (£10.)—BARCLAY FIELD, Beechy Lees, Otford, for Goldfinder 321, born July 6, 1887; s. Goldsmith 391, d. Dewberry 2217 by Bedford 316.

554 III. (£5.)—W. WOOD, JUN., Hassocks, for Jubilee 826, born Feb. 13, 1887, bred by C. Child, Slinfold; s. Buffer 663, d. Juno 2874 by Berry 259.

553 R. N. & H. C.—C. T. LUCAS, Warnham Ct., Horsham, for Golden Horn.

Class 74.—*Sussex Bulls, calved in 1888 or 1889.* [9 entries, 4 absent.]

555 I. (£20.)—AYLESBURY DAIRY CO., LIM., Horsham, for Lord Oxeys 954, born Aug. 24, 1888, bred by R. Whitehead, Paddockhurst, Crawley; s. Goldust 11th 677, d. Marguerite 4066 by Frankenstein 4th 540.

559 II. (£10.)—J. STEWART HODGSON, Lythe Hill Farm, Haslemere, born Mar. 28, 1889; s. Silversmith 849, d. Peace 2nd 2916 by Royal Kilburn 401.

557 III. (£5.)—JOSEPH GODMAN, Park Hatch, Godalming, for Oxford Duke 4th 1014, born Feb. 20, 1889; s. Oxford Duke 709, d. Noble Lady 2911 by Napoleon 3rd 396.

558 R. N.—G. O. HERRON, Glovers, Charlwood, Surrey, for Hall 887.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Class 75.—Sussex Cows or Heifers (in-milk or in-calf), calved before or in 1887. [6 entries, 1 absent.]

- 569 I. (£20).—LOUIS HUTH, Possingworth, Waldron, for Virgin 20th 4451, born June 7, 1887, calved March 5, 1890; s. Lord Beckley 6th 700, d. Virgin 17th 3856 by Fitzgerald 498.
- 567 II. (£10).—J. STEWART HODGSON, Lythe Hill Farm, Haslemere, for Peace 6th 4108, born January 13, 1887, calved February 25, 1890; s. Prince Rufus 515, d. Peace 2nd 2916 by Royal Kilburn 401.
- 565 III. (£5).—W. S. FORSTER, Gore Court, Maidstone, for Rosebud 1st 3825, born Dec. 20, 1881, bred by E. Charrington, Reigate; s. Frankenstein 2nd 328, d. Young Cleopatra 2509 by Young Hartley 444.
- 566 E. N. & H. C.—JOSEPH GODMAN for Columbine 2nd 3191.
- 568 Com.—LOUIS HUTH, Possingworth, for Virgin 19th 4449.

Class 76.—Sussex Heifers, calved in 1888 or 1889. [10 entries, 2 absent.]

- 570 I. (£15).—MAJOR M. G. BEST, Park House, Boxley, Kent, for Pearl 46 born Jan. 1, 1889; s. Goldsmith 391, d. Alice (vol. iv. p. 53) by Wickham's Bull.
- 574 II. (£10).—W. S. FORSTER, Gore Court, Maidstone, for Damsel 47 born Apr. 18, 1888; s. Careful 741, d. Pretty Maid 6th 3563 by Hop Boy 544.
- 576 III. (£5).—JOS. GODMAN, Park Hatch, Godalming, for Noble Lady 2. 4420, born Jan. 10, 1888; s. Oxford Duke 708, d. Noble Lady 2nd 3541 by Goodboy 541.
- 572 E. N. & H. C.—BARCLAY FIELD, Beechy Lees, Otford, for Berry 8th. H. C.—W. S. FORSTER for No. 575, Peeress; J. S. HODGSON for No. 578, Crocus 3rd.
- 573 Com.—BARCLAY FIELD, Beechy Lees, Otford, Kent, for Berry 10th.

Welsh.

Class 77.—Welsh Bulls, calved in 1885, 1886, or 1887. [2 entries.]

- 580 I. (£20).—LORD HARLECH, Glyn, Talsarnan, N. Wales, for Hundi 150, born Jan. 6 or 11, 1886, bred by the Earl of Gower; s. Zulu 129, d. Peggy Lewis 2nd 262 by Prince of Wales 63.
- 581 II. (£10).—H. R. SANDBACH, Hafodunos, Abergelle, for Owain-ap-Gwilym, born Jan. 30, 1886, bred by W. Jones, Taihirion, Gaerwen; s. Ap-Gwilym.

Class 78.—Welsh Bulls, calved in 1888 or 1889. [2 entries.]

- 582 I. (£20).—LORD HARLECH, Glyn, Talsarnan, N. Wales, for Black Knight, born Feb. 10, 1888; s. Moel Hebog, d. Lady Helen.
- 583 II. (£10).—H. R. SANDBACH, Hafodunos for Sir Mona, born Jan. 8, 1888, bred by W. Jones, Taihirion, Gaerwen; s. Sir William, d. Dilys by Gwilym.

Class 79.—Welsh Cows or Heifers, born before or in 1887. [No entry.]

Class 80.—Welsh Heifers, calved in 1888 or 1889. [No entry.]

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Red Polled.

Class 81.—Red Polled Bulls, calved 1885, 1886, or 1887.

[6 entries, none absent.]

- 589 I. (£20.)—R. H. MASON, Necton Hall, Swaffham, for Erebus 841, born Apr. 24, 1885, bred by T. Fulcher, Elmham, E. Dereham; s. Falstaff 303, d. Elm Branch 1482 by Rufus 188.
- 586 II. (£10.)—J. J. COLMAN, M.P., Carrow House, Norwich, for Iago 1025, born Jan. 20, 1885; s. Othello 713, d. Silent Lady 1855 by Rufus 188.
- 584 III. (£5.)—W. A. TYSSSEN AMHERST, M.P., Didlington Hall, Brandon, for Masher 1232, born Apr. 9, 1887; s. Morella 895, d. Didlington Davy 2148 by Davyson 7th 476.
- 588 R. N.—LORD HASTINGS, Melton Constable, Norfolk, for Viceroy 1448.

Class 82.—Red Polled Bulls, calved in 1888 or 1889.

[9 entries, 3 absent.]

- 598 I. (£20.)—J. J. COLMAN, M.P., Carrow House, Norwich, for Laureate 1563, born Jan. 12, 1888; s. Falstaff 303, d. Laura 2304 by Rufus 188.
- 597 II. (£10.)—LORD HASTINGS, Melton Constable, Norfolk, for Disturbance 1506, born April 17, 1888; s. Melton 1040, d. Lady Day 2289 by Davyson 7th 476.
- 590 III. (£5.)—W. A. TYSSSEN AMHERST, M.P., Didlington Hall, Brandon, for Monk 1573, born March 7, 1888; s. Morella 895, d. Ninny 3617 by Didlington Davyson 2nd 657.
- 592 R. N.—J. J. COLMAN, M.P., Carrow Ho., Norwich, for The Gem 1832.

Class 83.—Red Polled Cows or Heifers (in-milk or in-calf), calved before or in 1887. [5 entries, 1 absent.]

- 601 I. (£20.)—J. J. COLMAN, M.P., Carrow House, Norwich, for Doris 4532, born Oct. 11, 1887, calved Feb. 26, 1890; s. Falstaff 303, d. Dolly 1463 by Rufus 188.
- 599 II. (£10.)—W. A. TYSSSEN AMHERST, M.P., Didlington Hall, Brandon, for Poppety 2nd 4289, born Feb. 22, 1887, calved Jan. 4, 1890; s. Didlington Davyson 2nd 657, d. Poppinette 2455 by Davyson 3rd 48.
- 600 III. (£5.)—W. A. TYSSSEN AMHERST, M.P., for Emblem 2782, born Feb. 4, 1884, calved Mar. 22, 1890; s. Davyson 3rd 48, d. Eleanor 1477 by Rufus 285.
- 603 R. N. & G.—A. G. LUCAS, Ashlyns Hall, Herts, for Ashlyns Pink 3242.

Class 84.—Red Polled Heifers, calved in 1888 or 1889.

[11 entries, 2 absent.]

- 607 I. (£15.)—J. J. COLMAN, M.P., for Prize 5077, born Apr. 8, 1888, bred by Garrett Taylor; s. Cromwell 647, d. Prim 3064 by Philip 538.
- 604 II. (£10.)—W. A. TYSSSEN AMHERST, M.P., Didlington Hall, Brandon, for Emerald 4874, born Feb. 6, 1888; s. Didlington Davyson 2nd 657, d. Emblem 2782 by Davyson 3rd 48.
- 605 III. (£5.)—W. A. TYSSSEN AMHERST, M.P., for Saltarella 5110, born July 23, 1888; s. Didlington Davyson 4th 1003, d. Satanella 3732 by Cortes 645.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 612 **B. N. & H. C.**—**LORD HASTINGS**, Melton Constable, for *Ruperta* 2nd 5935.
H. C.—**H. P. GREEN** for No. 608, *Caistor Rose*; **A. G. LUCAS** for No. 614, *Donna Anna*.
Com.—**H. P. GREEN** for No. 610, *Ultradina*; **LORD HASTINGS** for Nos. 611, *Radiance*, 613, *Charity Girl*.

Jerseys.

Class 85.—*Jersey Bulls, calved in 1884, 1885, 1886, or 1887.*

[7 entries, 2 absent.]

- 618 **I. (£20.)**—**MRS. CUSTANCE**, Brook Heath, Breamore, Wilts, for *Thornford Gem* 2943, grey, born Aug. 15, 1886, bred by **H. J. Cornish**, Thornford, Dorset; s. *Earl of St. Martin* 1549, d. *Daisy's Pet* (imported) by *Jacquot* 2nd 1701.
619 **II. (£10.)**—**W. N. GILL**, Comprigney, Truro, for *Egypt Lad* 3rd, fawn, born May 16, 1887, bred by **J. A. Gibaut**, Egypt Farm, Trinity, Jersey; s. *Solomon's Lad* I.H.B. 852, d. *Haute-Croix Gem* I.H.B. 4600 F.S.H.C.
617 **III. (£5.)**—**H. J. CORNISH**, Thornford, Dorset, for *Kaiser's Prince*, I.H.B. 993 H.C., grey, born Dec. 1, 1886, bred by **F. P. Haquonil**, St. Owens, Jersey; s. *Kaiser* 2551, d. *Princess Ruby* 6218 F.S.O.
615 **B. N. & H. C.**—**JAMES BLYTH**, Stansted, for *Grouville's Champion*.
616 **Com.**—**FRANK BRADSHAW**, Lifton Park, Devon, for *Figaro*.

Class 86.—*Jersey Bulls, calved in 1888.* [9 entries, none absent.]

- 622 **I. (£20.)**—**JAMES BLYTH**, Wood Ho., Stansted, Essex, for *Sir Joseph*, dark fawn, born Sept. 20, bred by **G. E. Hawkins**, Cambridge; s. *Sir Josephus*, d. *Bella's Fancy* by *Georgius* I.H.B. 417.
630 **II. (£10.)**—**FRANK WILLAN**, Thorn Hill Park, Bitterne, Hants, for *Gaverock*, grey, born March 29, bred by **F. E. H. Becquet**, St. Peters, Jersey; s. *Pollux* I.H.B. 871, d. *Brown Floscea* 2nd I.H.B. 1166.
624 **III. (£5.)**—**EDWIN CASH**, St. John's College, Cambridge, for *Augerez Nelson*, grey, born Sept. 8, bred by **John du Val**, Augerez, St. Peters, Jersey; s. *Lord Nelson* I.H.B. 900, d. *Augerez Daisy* I.H.B. 2135.
628 **B. N. & H. C.**—**MRS. PERKINS**, Holmwood, Surrey, for *Bombardier*.
629 **Com.**—**LORD ROTHSCHILD**, Tring Park, Herts, for *Pandora's Boy*.

Class 87.—*Jersey Bulls, calved in 1889.* [33 entries, 10 absent.]

- 639 **I. (£20.)**—**EDWIN CASH**, St. John's College, Cambridge, for *Grouville's Mannikin*, whole colour, born July 20; s. *Grouville's Champion*, d. *Mabel S.* by *Wolseley's Glory* 2nd 2169.
657 **II. (£10.)**—**LORD ROTHSCHILD**, Tring Park, Herts, for *Columbus*, dark grey, born Feb. 10, bred by **F. Renault**, St. Marys, Jersey; s. *Blue Prince*, I.H.B. 1071 P.S., d. *Clemence* I.H.B. 7353 F.S.
643 **III. (£5.)**—**J. W. CROOKES**, Little Testwood, Hants, for *Pomona's Daily*, brown, born Apr. 24; s. *Pomona's Boy* 2774, d. *La Pousse* by *Forget Me Not* 260.
663 **B. N. & H. C.**—**FRANK WILLAN**, Thorn Hill Park, Hants, for *Dandy*.
H. C.—**W. ALEXANDER, JUN.**, for No. 631, *Rosa's Wonder*; **J. BLYTH** for No. 636, *Carlo's Fancy*; **J. BRUTON** for No. 638, *Vulcan*; **H. J. CORNISH** for No. 642, *Kitty's Wonder*; **W. N. GILL** for No. 649, *King Lotus*; **LORD ROTHSCHILD** for No. 659, *Albany*; **W. D. TUCKER** for No. 662, *Maian Lad*.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Class 88.—Jersey Cows or Heifers (in-milk or in-calf), calved before or in 1887. [37 entries, 10 absent.]

- 664 I. (£20).—WM. ALEXANDER, JUN., Les Marais, St. Marys, Jersey, for Wigton I.H.B. 2681 H.C., light brown, born Dec. 26, 1886, calved Mar. 3, 1890, bred by W. Luce, St. Saviours; s. Egypt Lad 665, d. Kingston 3912.
- 668 II. (£10).—JAMES BLYTH, Wood House, Stansted, for Victoria, fawn and white, born January 24, 1886, bred by J. Falle, St. Martins, Jersey; s. Wolseley 2165, d. Gentile 3rd I.H.B. 879, by Umpire 2nd I.H.B. 232.
- 671 III. (£5).—JAMES BLYTH, Wood Ho., Stansted, for Sweet Secret E.H.B. (vol. iv. p. 624), orange fawn, born Dec. 11, 1882, calved April 10, 1890, bred by G. Collas, Grouville, Jersey; s. Cicero 144, d. Secret I.H.B. 2375.
- 677 R. N. & H. C.—H. J. CORNISH for Lily Brown 3rd; s. Volunteer 2983.
H. C.—JOSEPH BRUTTON, for Nos. 675, Sultan 11th, and 676, Golden Lass 4th; H. J. CORNISH for No. 678 Brebis 3rd; MAISONNETTE DAIRY Co. for No. 683, Pearl 2nd; G. W. PALMER for No. 685, Bijou IV.
- 670 Com.—JAMES BLYTH for Fancy's Daisy.

Class 89.—Jersey Heifers, calved in 1888. [51 entries, 10 absent.]

- 712 I. (£15).—H. J. CORNISH, Thornford, Dorset, for Little Mecca, fawn, born April 1, bred by J. J. Le Moignan, Jersey; s. Bourgeois 2nd I.H.B. 896, d. Mecca I.H.B. 3975.
- 703 II. (£10).—W. ALEXANDER, JUN., Les Marais, St. Marys, Jersey, for Snowflake 4th, grey, born May 25, bred by J. C. Le Sueur, St. Saviours, Jersey; s. Everton King 390, d. Snowflake 714 by Happy 309.
- 745 III. (£5).—W. D. TUCKER, 78, High St., Southampton, for Tonquine 2nd, brown, born Feb. 11, bred by J. Luce, St. Lawrence, Jersey; s. Miltiades 868, d. Tonquine 3986.
- 717 R. N. & H. C.—J. A. DESREAU for Satisfaction; s. Lord Nelson 900.
H. C.—W. ALEXANDER, JUN., for Nos. 703, Philippa 5th and 706, Apothecaire; JOSEPH BRUTTON for No. 710, Mabel 21st; FOWLER & DE LA PERRELLE for No. 726, Test Me; LORD ROTHSCHILD for No. 738, Tulip; JOHN TREMAYNE for No. 740, Oakleaf.
- Com.—G. F. BROOKE for No. 709, Crocus 4th; HON. MRS. CREIL HOWARD for Nos. 730, Holly of Lowther, 731, Honewort; JOHN TREMAYNE for No. 739, Stella.

Class 90.—Jersey Heifers, calved in 1889. [32 entries, 6 absent.]

- 765 I. (£15).—J. W. CROOKES, Little Testwood, Totton, Hants, for Pomona's Charm, light cream fawn, born June 30; s. Pomona's Boy 2774, d. Pontae Lady I.H.B. 8658 by Grey of the East 284.
- 775 II. (£10).—LORD ROTHSCHILD, Tring Park, Herts, for Miss Rosy, fawn, born March 11, bred by W. Alexander, Jun., St. Marys, Jersey; s. Rosy's Wonder I.H.B. 835 H.S.P.S., d. La Mauve 3rd by Noble 1st.
- 764 III. (£5).—JOHN W. CROOKES, for Rosy Dawn, grey and white, born Sept. 30; s. Rosy's Myra U.D., d. Free Rosy 7423 P.S.
- 782 R. N. & H. C.—R. P. WHEADON, Ilminster, for La Sente's Daisy 3rd.
H. C.—JAMES BLYTH for Nos. 754, Rosa Bonheur, 755, Rhododendron; H. J. CORNISH for No. 760, Miranda; J. W. CROOKES for No. 763, Red Light; R. J. POPE for No. 772, Lively's Princess; JOHN TREMAYNE for No. 776, Quercus.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Guernseys.

Class 91.—Guernsey Bulls, calved in 1884, 1885, 1886, or 1887.

[8 entries, 4 absent.]

- 785 I. (£20).—W. H. CARRINGTON, Friquet, Castel, Guernsey, for Rydale 475 P.S., orange, fawn, & white, born Aug. 1, 1886; s. Volage 98 P.S., d. Maidenhead 1694.
- 791 II. (£10).—H. M. OZANNE, Lilyvale, Castel, Guernsey, for Souvenir 521 R.G.A.S., fawn & white, born Dec. 22, 1887; s. Zanzibar 305 P.S., d. Unity 1576 by Golden Fleece.
- 790 III. (£5).—SIR F. A. MONTEFIORE, Bt., Worth Park, Crawley, for Black Prince 198 E.G.H.B., fawn & white, born May 3, 1887, bred by Mrs. Martel, Preel; s. Zanzibar 305 P.S., R.G.A.S., d. Lily of the Preel 1552 P.S.
- 786 R. N. & H. C.—FOWLER & DE LA PERRELLE for Advantage 463, R.G.H.B. P.S.

Class 92.—Guernsey Bulls, calved in 1888 or 1889.

[21 entries, 6 absent.]

- 811 I. (£20).—COL. H. W. SHAKERLEY, Castle Malwood, Lyndhurst, for Paradox 352 E.G.H.B., fawn & white, born Feb. 21, 1888, bred by P. Martel, Mare, Castel, Guernsey; s. Marc Antony 386 P.S., d. May Rose 2nd.
- 796 II. (£10).—W. A. GLYNN, Seagrove, Seaview, Ryde, for Frolic 2nd, orange, fawn, & white, born Feb. 14, 1888; s. Hopeful 25 E.G.H.B., d. Fisky 357.
- 801 III. (£5).—COL. A. C. MACLEAY, Glasshayes, Lyndhurst, for Papageno, fawn and white, born Feb. 25, 1889, bred by Caleb Barfoot, Lake, Bishopstoke; s. Teaser 219 E.G.H.B., d. Gentrice 561 E.G.H.B.
- 793 R. N. & H. C.—CALEB BARFOOT for Squire of Figtree 370 E.G.H.B.
H. C.—W. J. BECKINGHAM for No. 794, Playful Lad; COL. A. C. MACLEAY for No. 802, Pepin 4th; LORD MONTAGU for No. 804, Conqueror; SIR F. A. MONTEFIORE, Bt. for No. 807 Loftus.
- Com.—G. LONG, No. 798, El Dorado; W. MADDICK, No. 803, Nimble.

Class 93.—Guernsey Cows or Heifers (in-milk or in-calf), calved before or in 1887. [18 entries, 4 absent.]

- 819 I. (£20).—MRS. D. O. LE PATOUREL, Les Quartiers, St. Sampsons, Guernsey, for Pretty Dairy Maid 2nd 1469 R.G.A.S., fawn, born Mar. 20, 1882, bred by R. Best, St. Andrews; s. St. Andrews 2nd, d. Pretty Dairy Maid.
- 820 II. (£10).—GEO. LONG, Ogbourne St. Andrew, Marlborough, for Nora 3rd 875 E.G.H.B., orange, fawn, & white, born March 25, 1887; s. Cloth of Gold 17th 87, d. Nora 2nd 437 by Dr. Bill 161.
- 818 III. (£5).—W. A. GLYNN, Seagrove, Seaview, Ryde, for Fairy 2nd 105 E.G.H.B., orange, fawn, and white, born April 11, 1878, calved April 5, 1890; s. Honest Tom, d. Fairy 1st by Johnny 1st.
- R. N. & H. C.—H. M. OZANNE for No. 825 Unity 1576, R.G.A.S.
H. C.—W. H. CARRINGTON for No. 813, Merry Bell 2nd; J. O. FORSTER for No. 817, Antona; COL. A. C. MACLEAY for No. 821, Francisca; W. MADDICK for No. 822, Miss Evelyn.
- 829 Com.—W. D. TUCKER for Fleurie Des Rue Frairies 3310 G.H.B.

Class 94.—Guernsey Heifers, calved in 1888 or 1889.

[34 entries, 7 absent.]

- 834 I. (£15).—J. G. BROWNING, Carrefour, St. Andrews, Guernsey, for Pretty Dairy Maid 4th 2084, lemon, fawn, & white, born May 30, 1888; s. Zanzibar 305, d. Petty Dairy Maid 2nd by St. Andrews 2nd.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 844 II. (£10).—COL. A. C. MACLEAY, Glasshayes, Lyndhurst, for Damsel 2nd 1015 E.G.H.B., lemon and white, born March 4, 1888; s. Pépin 49 E.G.H.B., *d.* Damsel 85 E.G.H.B.
- 842 III. (£5).—GEO. LONG, Ogbourne St. Andrew, Marlborough, for Nora 6th, fawn and white, born Aug. 1, 1889; s. Rouge D'Or 208, *d.* Nora 3rd 875 *by* Cloth of Gold 17th 87.
- 854 B. N. & H. C.—SIR F. A. MONTEFIORE, Bt., Worth Park, Crawley, for Una. H. C.—W. A. GLYNN for No. 840, Amelia; COL. A. C. MACLEAY for No. 846, Beatrice; WM. MALE for Nos. 849, Daisy of Saints, 850, Lollipop; LORD MONTAGU for Nos. 851, Queen Bee, 852, Lily du Preel 2nd; H. M. OZANNE for Nos. 857, Emblem, 858, Hydra.
- Com.—GEORGE LONG for No. 843, Nora 5th; W. D. TUCKER for Nos. 861, Daisy de L'Epenel, 863, Only One.

Kerries.¹

Class 95.—Kerry Bulls, calved in 1884, 1885, 1886, 1887, 1888, or 1889. [10 entries, none absent.]

- 865A I. (£15).—RICHARD BARTER, St. Ann's Hill, Cork, for Aicme Shuel 360, born Sept. 1887, breeder unknown.
- 873 II. (£10).—JAMES ROBERTSON, La Mancha, Malahide, Co. Dublin, for Colorado, born Aug. 22, 1888, bred by R. H. Stubber, Moyne Ho., Durtow.
- B. N. & H. C.—PIERCE MAHONY, M.P., for No. 870, The O'Dowd.
- H. C.—PIERCE MAHONY, M.P., for Nos. 869, Mac Dervoghal, 871, Aengus.
- Com.—PIERCE MAHONY, M.P., for No. 868, Mac Murra.

Class 96.—Kerry Cows or Heifers (in-milk or in-calf), calved before or in 1887. [24 entries, 3 absent.]

- 895 I. (£15).—MARTIN J. SUTTON, Kidmore Grange, Caversham, for Peep, calved March 23, 1890, age and breeder unknown.
- 876 II. (£10).—RICHARD BARTER, St. Ann's Hill, Cork, for Aicme Venus 426, born May 1883, calved May 6, 1890, breeder unknown.
- 894 B. N. & H. C.—MARTIN J. SUTTON, Kidmore Grange, for Violet
- H. C.—MARQUESS OF LANSDOWNE for No. 882, Sloe; PIERCE MAHONY, M.P., for No. 885, Oriol-an-Treas; H. PARSONS for No. 888, Pity; JAMES ROBERTSON for No. 891, Ivy; MARTIN J. SUTTON for No. 897, Flora.
- Com.—RICHARD BARTER for Nos. 878, Aicme Teaty, 880, Aicme Shee; JAMES ROBERTSON for Nos. 889, Balm, 890, 892, Camation.

Class 97.—Kerry Heifers, calved in 1888 or 1889. [11 entries, 2 absent.]

- 898 I. (£10).—RICHARD BARTER, St. Ann's Hill, Cork, for Aicme Jessie, born in May 1888, breeder unknown.
- 904 II. (£5).—PIERCE MAHONY, M.P., Kilmorna, Listowel, Kerry, for Nair, born in 1888, breeder unknown.
- 901 B. N. & H. C.—THE MARQUESS OF LANSDOWNE, for Belle of the Lake.
- 900 H. C.—THE DUKE OF HAMILTON AND BRANDON, K.T.
- Com.—PIERCE MAHONY, M.P., for No. 903, Darerca; JAMES ROBERTSON for Nos. 905, Genista, 906, Perriwinkle, 908, Auburn.

¹ Prizes given by the Plymouth Local Committee.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Dexter Kerries.¹

Class 98.—*Dexter Kerry Bulls, calved in 1884, 1885, 1886, 1887, 1888, or 1889.* [10 entries, 4 absent.]

- 916 I. (£15).—G. F. ROUMIEU, Runwick House, Farnham, for *Fascination*, born in 1887, breeder unknown.
 909 II. (£10).—LORD ASHBURTON, The Grange, Alresford, for *Chang* 1154, born about 1888, breeder unknown.
 918 R. N. & H. C.—MARTIN J. SUTTON, Kidmore Grange, for *Paradox*.
 H. C.—THE MARQUESS CONYNNGHAM, for No. 913, *Sunlight*; MARTIN J. SUTTON for No. 917, *Othello*.
 915 Com.—JAMES ROBERTSON, for *Sne*.

Class 99.—*Dexter Kerry Cows or Heifers (in-milk or in-calf), calved before or in 1887.* [30 entries, 1 absent.]

- 947 I. (£15).—HAROLD SWITHINBANK, Denham Court, Uxbridge, for *Moirs* 1053, born in 1887, calved May 8, 1890, breeder unknown.
 943 II. (£10).—MARTIN J. SUTTON, Kidmore Grange, Caversham, for *Red Rose*, born 1886, breeder unknown.
 924 R. N. & H. C.—LORD ASHBURTON, Alresford, for *Mavourene* 1151.
 H. C.—LORD ASHBURTON for Nos. 919, *Yum Yum*, 920, *Queen Mab*; RICHARD BARTER for Nos. 926, *Aicme Arnott*, 927, *Aicme Jane*, 931, *Aicme Carrig*; THE MARQUESS CONYNNGHAM for No. 932, *Poppy*; MARTIN J. SUTTON for Nos. 944, *Peach*, 945, *Silene*, 946, *Rosemary*; HAROLD SWITHINBANK for No. 948, *Lorna*.
 Com.—LORD ASHBURTON for No. 923, *Midget*; RICHARD BARTER for Nos. 928, *Aicme Mac*, 929, *Aicme Ville*; THE MARQUESS CONYNNGHAM for No. 935, *Blossom*; JAMES ROBERTSON for No. 942, *Kenmare*.

Class 100.—*Dexter Kerry Heifers, calved in 1888 or 1889.*
 [12 entries, 1 absent.]

- 960 I. (£10).—HAROLD SWITHINBANK, Denham Court, Uxbridge, for *Dot* 1042, born 1888, breeder unknown.
 957 II. (£5).—G. F. ROUMIEU, Runwick House, Farnham, for *Balsam*, born 1888, breeder unknown.
 958 R. N. & H. C.—MARTIN J. SUTTON, Kidmore Grange, Caversham, for *Kidmore Gem*, born April 26, 1889; s. *Paradox*, d. *Gwynn*.
 H. C.—LORD ASHBURTON for No. 949, *Chin Chin*; RICHARD BARTER for Nos. 950, *Aicme Jenny*, 951; PIERCE MAHONY, M.P., for No. 954, *Bog Oak*; HAROLD SWITHINBANK for No. 959, *Nell*.

DAIRY CATTLE.

Class 101.—*Dairy Cows in Milk, of any breed or cross, giving the greatest quantity of milk containing not less than 12 per cent. Solids, and 3 per cent. Butter Fat.* [10 entries, 3 absent.]

Class 101 a.—*Dairy Cows, over 1200 lb. live-weight.*

- 964 I. (£15).—THOMAS CUNDY, Benbow St., Stoke, Devonport, for *Beauty* (crossbred), yellow and white; s. *Devonian*, d. *Marigold*.

¹ Prizes given by the Plymouth Local Committee.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 965 II. (£10.)—THOMAS CUNDY for *Honesty* (South Devon), bred by Mr. Quinn, Longcombe Farm, Berry Pomeroy, Totnes; s. Old Jumbo, d. Alice.

Class 101 b.—Dairy Cows, between 900 and 1200 lb. live-weight.

- 968 I. (£15.)—SIR F. A. MONTEFIORE, Bt., Worth Pk., Crawley, for *Constance* 2nd (Guernsey), 166 P.S. L.G.A.S. fawn & white, born Jan. 15, 1883, bred by D. Le Cheminant, Guernsey; s. Presto, No. 14 P.S. R.G.A.S., d. Constance I.
963 II. (£10.)—JOSEPH BRUTTON, 7 Princess Street, Yeovil, Som., for *Mandie* (Jersey), born July 27, 1883, calved March 30, 1890; s. T.M. 2113, d. Dolly by William 2160.

Class 101 c.—Dairy Cows under 900 lb. live-weight.

- 962 I. (£15.)—GEO. BLACKWELL, Barton End, Nailsworth, for *Greek Maid* 2nd (Jersey), broken colour, born Jan. 6, 1886, calved April 21, 1889.

SHEEP.

Leicesters.

Class 102.—Leicester Two-Shear Rams. [10 entries, 1 absent.]

975. I. (£15.)—T. H. HUTCHINSON, Manor Ho., Catterick, Yks., born March 24, 1889.
979 II. (£10.)—D. LINTON, Low Street Brewery, Bedale, born April 18, 1888, bred by J. & D. Linton, Low Street Brewery.
976 III. (£5.)—E. F. JORDAN, Eastburn, Driffield, born April 1888.
977 R. N.—E. F. JORDAN, born April 1888.

Class 103.—Shearling Rams. [15 entries, 2 absent.]

- 993 I. (£15.)—D. LINTON, Low Street Brewery, Catterick, Yks., born March 20, 1889, bred by J. & D. Linton, Low Street Brewery.
994 II. (£10.)—D. LINTON, born March 17, 1889, bred by J. & D. Linton.
991 III. (£5.)—E. F. JORDAN, Eastburn, Driffield, born April 1889.
990 R. N. & H. C.—E. F. JORDAN, born April 1890.

Class 104.—Pen of Three Leicester Ram Lambs, dropped in 1890. [5 entries, 1 absent.]

- 999 I. (£10.)—D. LINTON, Low Street Brewery, Bedale, born March 16, 1890, bred by J. & D. Linton, Low Street Brewery.
998 II. (£5.)—T. H. HUTCHINSON, Manor House, Catterick, born in March.

Class 105.—Pen of Three Leicester Shearling Ewes, of the same flock. [11 entries, none absent.]

- 1010 I. (£15.)—D. LINTON, Low Street Brewery, Bedale, born March 27, 1889, bred by J. & D. Linton, Low Street Brewery.
1008 II. (£10.)—E. F. JORDAN, Eastburn, Driffield, born April 1889.
1007 III. (£5.)—E. F. JORDAN, Eastburn, born April 1889.
1009 R. N. & H. C.—D. LINTON, born March 27, 1889.
Com.—R. & G. HARRISON for Nos. 1003 & 1004.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Cotswolds.

Class 106.—*Cotswold Two-Shear Rams.* [3 entries, none absent.]

- 1014 I. (£15.)—R. GARNE, Aldsworth, Northleach, Glos., born March 1888.
1012 II. (£10.)—GEO. BAGNALL, Westwell Manor, Burford, born Feb. 1888.

Class 107.—*Cotswold Shearling Rams.* [13 entries, 3 absent.]

- 1021 I. (£15.)—R. SWANWICK, R. A. C. Farm, Cirencester, born Feb. 14, 1889.
1015 II. (£10.)—GEO. BAGNALL, Westwell Manor, Burford, born Feb. 1889.
1016 III. (£5.)—GEORGE BAGNALL, Westwell Manor, born Feb. 1889.
1023 R. N. & H. C.—RUSSELL SWANWICK, R. A. C. Farm, born Feb. 14, 1889.
1018 H. C.—ROBERT GARNE, born Feb. 1889.
1019 Com.—ROBERT GARNE, born Feb. 1889.

Class 108.—*Pen of Three Cotswold Ram Lambs, dropped in 1890.*
[9 entries, 3 absent.]

- 1036 I. (£10.)—W. THOMAS, The Hayes, Sully, Penarth, born in Feb. 1890.
1032 II. (£5.)—ROBT. GARNE, Aldsworth, Northleach, Glos., born Feb. 1890.
1033 R. N. & H. C.—ROBERT GARNE, born Feb. 1890.
1034 H. C.—RUSSELL SWANWICK, born Jan. 16, 1890.

Class 109.—*Pen of Three Shearling Cotswold Ewes, of the same flock.*
[3 entries, none absent.]

- 1037 I. (£15.)—GEO. BAGNALL, Westwell Manor, Burford, born Feb. 1889.
1038 II. (£10.)—GEO. BAGNALL, born Feb. 1889.
1039 H. C.—GEO. BAGNALL, born Feb. 1889.

Lincolns.

Class 110.—*Lincoln Two-Shear Rams.* [4 entries, none absent.]

- 1043 I. (£15.)—ROBT. WRIGHT, Nocton Heath, Lincoln, born Feb. or March 1888, bred by C. S. Dickinson, Branston, Lincoln.
1042 II. (£10.)—ROBT. WRIGHT, born Feb. or Mar. 1888, bred by J. H. Casswell, Laughton, Folkingham, Lincoln.
1041 III. (£5.)—JOHN PEARS, Mere, Lincoln, for Laughton, born Mar. 10, 1888, bred by J. H. Casswell, s. Willoughby; d. Lustre by Promise.

Class 111.—*Lincoln Shearling Rams.* [14 entries, 4 absent.]

- 1055 I. (£15.)—R. WRIGHT, Nocton Heath, Lincoln, born Feb. or Mar. 1889.
1046 II. (£10.)—H. DUDDING, Riby Grove, Grimsby, born about Mar. 1, 1889.
1056 III. (£5.)—R. WRIGHT, Nocton Heath, born Feb. or Mar. 1889.
1049 R. N.—HENRY DUDDING, born Mar. 1, 1889.
Com.—HENRY DUDDING for No. 1044; JOHN PEARS for No. 1053.

Class 112.—*Pen of Three Lincoln Ram Lambs, dropped in 1890.*
[6 entries, 2 absent.]

- 1061 I. (£10.)—JOHN PEARS, Mere, Lincoln, born Feb. 1890.
1063 II. (£5.)—R. WRIGHT, Nocton Heath, Lincoln, born Feb. or Mar. 1890.
1058 R. N. & H. C.—HENRY DUDDING, born Mar. 1, 1890.

Shropshire Sheep.

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[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Class 113.—*Pen of Three Shearling Lincoln Ewes, of the same flock.*
[6 entries, 2 absent.]

- 1069 I. (£15.)—R. WRIGHT, Nocton Heath, Lincoln, born Feb. or Mar. 1889.
1065 II. (£10.)—HENRY DUDDING, Riby Grove, Grimsby, born Mar. 1, 1889.
1064 III. (£5.)—HENRY DUDDING, born Mar. 1, 1889.

Oxford Downs.

Class 114.—*Oxford Down Two-Shear Rams.* [3 entries, none absent.]

- 1070 I. (£15.)—J. TREADWELL, Upper Winchendon, Bucks, for *Progress*, born about Feb. 14, 1888; s. Baron Druce 146, d. by Baron Bicester 129.
1071 II. (£10.)—J. TREADWELL, for *Grand Lord*, born about Jan. 20, 1888; s. His Lordship 347, d. by Baron Bicester 129.
1072 B. N.—J. TREADWELL, for *Windsor Favourite*, born about Feb. 7, 1888; s. Freelands Pride 145, d. by Royal Preston 128.

Class 115.—*Oxford Down Shearling Rams.* [13 entries, none absent.]

- 1076 I. (£15.)—ALBERT BRASSEY, Heythrop Park, Chipping Norton, for *Prime Minister*, born Jan. 28, 1889; s. Young Howard 544.
1085 II. (£10.)—J. TREADWELL, Upper Winchendon, Bucks, for *Royal Plymouth*, born about Feb. 14, 1889; s. Brassey's No. 22, 217, d. by Royal Preston 128.
1082 III. (£5.)—J. TREADWELL, for *Hobbs' Vicar*, born about Feb. 7, 1889; s. Irchester Vicar 373, d. by Hobbs' No. 6350.
1078 B. N. & H. G.—ALBERT BRASSEY, Heythrop Park; s. Compton 1st 244.
1079 Com.—Exors. of the late ZACHARIAH W. STILGON, Adderbury, Oxon.

Class 116.—*Pen of Three Oxford Down Ram Lambs, dropped in 1890.*
[6 entries, 2 absent.]

- 1086 I. (£10.)—GEORGE ADAMS, Pidnell, Faringdon, born about Jan. 15, 1890; s. Prince Edward 438, d. by Fyfield Duke 310.
1088 II. (£5.)—ALBERT BRASSEY, Heythrop Park, Oxon, born Jan. 21, 1890.
1091 B. N. & H. G.—WM. J. P. READING, Langford, Lechlade.

Class 117.—*Pen of Three Shearling Oxford Down Ewes, of the same flock.* [8 entries, 2 absent.]

- 1095 I. (£15.)—ALBERT BRASSEY, Heythrop Park, Chipping Norton, born Feb. 8, 1889; ss. Young Howard 544 and Sir John 469.
1092 II. (£10.)—GEORGE ADAMS, Pidnell, Faringdon, born about Jan. 15, 1889; s. Prince Edward 438, d. by Fyfield Duke 310.
1093 III. (£5.)—GEORGE ADAMS, born about Jan. 15, 1889; s. Prince Edward 438, d. by Fyfield Duke 310.
1094 B. N. & H. G.—G. ADAMS, s. Prince Edward 438, d. by Fyfield Duke 310.
1097 Com.—J. A. MILES, Highworth, born Feb. 15, 1889.

Shropshires.

Class 118.—*Shropshire Two-Shear Rams.* [25 entries, 5 absent.]

- 1115 I. (£15.)—ANDREW E. MANSELL, Astol, Shifnal, born Mar. 1888.
1104 II. (£10.)—A. S. BERRY, Pheasey Farm, Gt. Barr, Birmingham, for *Coven-*
try Choice, born Mar. 1888, bred by W. R. Mann, Bolarum, Leamington.

Award of Live-Stock Prizes at Plymouth.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 1012 III. (£5.)—MRS. BARRS, Odstone Hall, Atherstone, for **Rising Star**, born Mar. 1888; s. Ringleader 3693, d. by Pride of Freeford 957.
- 1101 R. N. & H. C.—FRANCIS BACH, Onibury, Craven Arms, born Mar. 3, 1888.
H. C.—FRANCIS BACH for No. 1100; A. G. LUCAS for No. 1114, Dudmaston 2nd; A. E. MANSELL for No. 1117; JOHN PRICE for No. 1121.
- Com.—JOHN BOURNE for No. 1105; GEORGE GRAHAM for No. 1111.

Class 119.—Shropshire Shearling Rams. [96 entries, 22 absent.]

- 1174 I. (£15.)—W. F. INGE, Thorpe Hall, Tamworth, born Mar. 1889.
- 1180 II. (£10.)—MRS. BARRS, Odstone Hall, Atherstone, born Mar. 1889.
- 1129 III. (£5.)—MRS. BARRS, born Mar. 1889.
- 1163 R. N. & H. C.—GEORGE GRAHAM, The Oaklands, near Birmingham.
H. C.—MRS. BARRS for Nos. 1127, 1128; A. S. BERRY for No. 1131; THOMAS FENN for Nos. 1158, 1159; GEORGE GRAHAM for Nos. 1160, 1162; W. F. INGE for Nos. 1171, 1172, 1173; A. E. MANSELL for Nos. 1184, 1185, 1187; T. S. MINTON for Nos. 1197, 1198; J. L. NAPER for Nos. 1202, 1203, 1204; M. WILLIAMS for No. 1219.
- Com.—F. BACH for No. 1125; A. S. BERRY for No. 1132; JOHN BOURNE for No. 1135; J. BOWEN-JONES for No. 1139; RICHARD BROWN for No. 1146; G. LEWIS for No. 1177; P. L. MILLS for No. 1193; J. L. NAPER for No. 1201; JOHN PRICE for No. 1209; H. TOWNSEND for No. 1217.

Class 120.—Pen of Three Shropshire Ram Lambs, dropped in 1890. [19 entries, 10 absent.]

- 1230 I. (£10.)—W. F. INGE, Thorpe Hall, Tamworth, born Feb. 1890.
- 1222 II. (£5.)—H. & A. BRADBURN, Pipe Place, Lichfield, born Feb. 1890.
- 1238 R. N. & H. C.—RICHARD THOMAS, Baschurch, Salop, born Mar. 1890.
H. C.—JOHN BOURNE for No. 1221; RICHARD BROWN for No. 1225.
- Com.—T. H. MILLER for No. 1236; WM. THOMAS for No. 1239.

Class 121.—Pen of Three Shearling Shropshire Ewes, of the same flock. [29 entries, 9 absent.]

- 1250 I. (£15.)—GEO. GRAHAM, The Oaklands, Birmingham, born Feb. 1889.
- 1259 II. (£10.)—T. S. MINTON, Montford, Salop, born Feb. 1889.
- 1251 III. (£5.)—GEORGE GRAHAM, born Feb. 1889.
- 1253 R. N. & H. C.—W. F. INGE, Thorpe Hall, Tamworth, born Mar. 1889.
H. C.—J. BOWEN-JONES for No. 1242; H. & A. BRADBURN for No. 1244; JOHN PRICE for No. 1264; A. TANNER for No. 1266.
- Com.—T. FENN for No. 1249; A. G. LUCAS for No. 1256; P. A. MUNTZ, M.P., for No. 1260; H. TOWNSEND for No. 1268.

Southdowns.**Class 122.—Southdown Two-Shear Rams.** [12 entries, none absent.]

- 1271 I. (£15, & Champion, £25.)—J. J. COLMAN, M.P., Carrow House, Norwich, born Feb. 1888.
- 1280 II. (£10.)—W. TOOP, Aldingbourne, Chichester, born abt. Feb. 12, 1888.
- 1278 III. (£5.)—THE DUKE OF RICHMOND & GORDON, K.G., born Feb. 1888.
- 1269 R. N. & H. C.—H.R.H. THE PRINCE OF WALES, K.G., born Mar. 1888.
- 1273 H. C.—E. ELLIS, Summersbury Hall, Shalford, Surrey, for Duke 2nd.
- 1274 Com.—E. ELLIS, for Summersbury.

¹ Cup given by Southdown Breeders for best Southdown Rams in Classes 122 and 123.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Class 123.—Southdown Shearling Rams. [33 entries, 6 absent.]

- 1281 I. (£15, & R. N. for Champion.)—H.R.H. THE PRINCE OF WALES, K.G., born Mar. 1889.
 1292 II. (£10.)—EDWIN ELLIS, Summersbury Hall, Shalford, Surrey, born about Feb. 14, 1889.
 1312 III. (£5.)—W. TOOP, Aldingbourne, Chichester, born about Feb. 12, 1889.
 1287 R. N. & H. C.—J. J. COLMAN, M.P., Carrow Ho., Norwich, born Feb. 1889.
 H. C.—THE DUKE OF HAMILTON & BRANDON, K.T., for No. 1293;
 W. TOOP for No. 1313.
 1303 Com.—HUGH PENFOLD, Selsey, Chichester, for Selsey Bill.

Class 124.—Pen of Three Southdown Ram Lambs, dropped in 1890.
 [14 entries, 4 absent.]

- 1318 I. (£10.)—EDWIN ELLIS, Summersbury Hall, Shalford, Surrey, born about Feb. 7, 1890.
 1327 II. (£5.)—W. TOOP, Aldingbourne, Chichester, born Feb. 12, 1890.
 1316 R. N. & H. C.—J. J. COLMAN, M.P., Carrow Ho., Norwich, born Feb. 1890.
 1322 H. C.—C. T. LUCAS, Warnham Court, Horsham.
 Com.—H.R.H. THE PRINCE OF WALES, K.G., for No. 1314; THE PAGHAM HARBOUR CO. for No. 1323.

Class 125.—Pen of Three Shearling Southdown Ewes, of the same flock. [16 entries, 3 absent.]

- 1331 I. (£15.)—J. J. COLMAN, M.P., Carrow Ho. Norwich, born Feb. 1889.
 1335 II. (£10.)—EDWIN ELLIS, Summersbury Hall, Shalford, Surrey, born about Feb. 14, 1889.
 1343 III. (£5.)—W. TOOP, Aldingbourne, Chichester, born about Feb. 14, 1889.
 1329 R. N. & H. C.—H.R.H. THE PRINCE OF WALES, K.G., born Mar. 1889.
 Com.—EDWIN ELLIS for No. 1334; THE DUKE OF RICHMOND AND GORDON, K.G., for No. 1341.

Hampshire Downs.

Class 126.—Hampshire Down Two-Shear Rams. [7 entries, 1 absent.]

- 1349 I. (£15.)—H. LAMBERT, Babraham, Cambridge, born about Jan. 21, 1888.
 1347 II. (£10.)—COLLEGE OF AGRICULTURE, Downton, born Jan. 17, 1888.
 1346 III. (£5.)—R. COLES, Middleton, Warminster, born about Jan. 20, 1888.
 1345 R. N.—ROBT. COLES, born Jan. 20, 1888.

Class 127.—Hampshire Down Shearling Rams. [14 entries, 4 absent.]

- 1360 I. (£15.)—H. LAMBERT, Babraham, Cambridge, born about Jan. 21, 1889.
 1354 II. (£10.)—ROBT. COLES, Middleton, Warminster, born abt. Jan. 20, 1889.
 1356 III. (£5.)—ROBERT COLES, born about Jan. 20, 1889.
 1353 R. N.—O. & T. COLES, Winterbourne Stoke, Wilts., born Feb. 1, 1889.

Class 128.—Pen of Three Hampshire Down Ram Lambs, dropped in 1890. [11 entries, 4 absent.]

- 1373 I. (£10.)—F. R. MOORE, Littlecott, Upavon, Wilts, born Jan. 1890.
 1372 II. (£5.)—F. R. MOORE, born Jan. 1890.
 1365 R. N. & H. C.—J. BARTON, Hackwood Farm, Basingstoke, born Jan. 1890.
 1371 H. C.—H. LAMBERT, Babraham, Cambridge, born about Jan. 21, 1890.
 1367 Com.—R. COLES, Middleton, Warminster, born about Jan. 20, 1890.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Class 129.—Pen of Three Shearling Hampshire Down Ewes, of the same flock. [4 entries, 1 absent.]

- 1377 I. (£15).—COLLEGE OF AGRICULTURE, Downton, born Jan. 17, 1889.
 1378 II. (£10).—COLLEGE OF AGRICULTURE, Downton, born Jan. 17, 1889.
 1376 E. N.—C. & T. COLES, Winterbourne Stoke, Wilts, born about Feb. 1, 1889.

Suffolks.

Class 130.—Suffolk Two-Shear Rams. [4 entries, none absent.]

- 1381 I. (£15).—E. GITTUS, Snailwell, Newmarket, for **Quite Royal**, born Feb. 25, 1888; s. Bendigo 1st, d. by Samson 2nd.
 1382 II. (£10).—T. L. ROBERSON & C. J. EATON, Hengrave, Bury St. Edmunds, for **Hengrave Pride**, born Feb. 22, 1888; s. Tommy 2nd 282.
 1380 E. N. & H. C.—THE MARQUIS OF BRISTOL for **Van Dyke 3rd**.
 1383 Com.—J. SMITH, Thorpe Hall, Hasketon, Suffolk, born Feb. 1888.

Class 131.—Suffolk Shearling Rams. [12 entries, 4 absent.]

- 1390 I. (£15).—EDWARD GITTUS, Snailwell, Newmarket, for **The Swell**, born Feb. 1889; s. **Quite Royal**, d. by Samson 2nd.
 1387 II. (£10).—THE MARQUIS OF BRISTOL, Ickworth Park, Suffolk, for **Van Dyke 5th**, born Jan. 29, 1889; s. Van Dyke Royal 2nd 827.
 1385 III. (£5).—THE MARQUIS OF BRISTOL, for **Van Gwynne Royal 4th**, born Jan. 25, 1889; s. Van Gwynne 1st 288.
 1391 E. N. & H. C.—EDWARD GITTUS for **Sailor**; s. **Sailor Prince**.
 Com.—THE MARQUIS OF BRISTOL for Nos. 1388, Van Dyke Royal 3rd, 1389, Van Gwynne 6th.

Class 132.—Pen of Three Suffolk Ram Lambs, dropped in 1890.
 [6 entries, 2 absent.]

- 1396 I. (£10).—THE MARQUIS OF BRISTOL, Ickworth Park, Suffolk, born Jan. 1890; ss. Van Dyke 5th, Van Dyke Royal 3rd, and Van Gwynne Royal 4th.
 1397 II. (£5).—THE MARQUIS OF BRISTOL, born Jan. 1890; ss. Van Gwynne Royal 3rd, Van Gwynne 1st 288, and Van Dyke 3rd 828.
 1399 E. N. & H. C.—T. L. ROBERSON & C. J. EATON, Hengrave, Suffolk.

Class 133.—Pen of Three Shearling Suffolk Ewes, of the same flock.
 [7 entries, 3 absent.]

- 1402 I. (£15).—THE MARQUIS OF BRISTOL, Ickworth Park, Suffolk, born Jan. 1889; ss. Van Gwynne 1st 288 and Van Dyke 3rd 828.
 1403 II. (£10).—THE MARQUIS OF BRISTOL, born Jan. 1889; ss. Van Gwynne Royal 2nd 832 and Van Dyke 3rd 828.
 1405 E. N. & H. C.—T. L. ROBERSON and C. EATON, Hengrave, Suffolk.

Somerset and Dorset Horned.

Class 134.—Somerset and Dorset Horned Rams, Two-Shear and upwards. [4 entries, none absent.]

- 1409 I. (£15).—H. FARTHING, Thurloxton, Taunton, for **Duke**, born Jan. 1, 1887.
 1412 II. (£10).—SAMUEL KIDNER, Bickley Farm, Milverton, Som., born Dec. 1887, bred by Mrs. Davies, Preston, Milverton.
 1410 E. N. & H. C.—JOHN KIDNER, Nynhead, Wellington, Som.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Class 135.—*Somerset and Dorset Horned Shearling Rams.*

[8 entries, none absent.]

- 1416 I. (£15).—HERBERT FARTHING, Thurloxton, Taunton, for Prince, born about Jan 1, 1889; s. Dorset.
 1414 II. (£10).—WM. J. CULVERWELL, Durleigh Farm, Bridgwater, born Jan. 14, 1889, bred by the late W. T. Culverwell, Durleigh Farm.
 1420 III. (£5).—S. KIDNER, Bickley Farm, Milverton, Som., born Dec. 1888.
 1417 R. N. & H. C.—JOHN KIDNER, Nynehead, Som., born Dec. 1888.
 1419 H. C.—S. KIDNER, Bickley Farm, Milverton, Som., born Dec. 1888.
 1415 Com.—HERBERT FARTHING, Thurloxton, Taunton, for Captain.

Class 136.—*Pen of Three Shearling Somerset and Dorset Horned Ewes, of the same flock.* [5 entries, none absent.]

- 1421 I. (£15).—WM. J. CULVERWELL, Durleigh Farm, Bridgwater, born Jan. 10, 1889, bred by the late W. T. Culverwell, Durleigh Farm.
 1423 II. (£10).—JOHN KIDNER, Nynehead, Wellington, Som., born Dec. 1888.
 1422 III. (£5).—WM. J. CULVERWELL, Durleigh Farm, born Jan. 15, 1889, bred by the late W. T. Culverwell, Durleigh Farm.
 1424 R. N. & H. C.—S. KIDNER, Bickley Farm, Milverton, Som., born Dec. 1888.
 1425 H. C.—E. J. STANLEY, M.P., Quantock Lodge, Bridgwater, born Jan. 1.

Devon Long-wool.

Class 137.—*Devon Long-wool Rams, Two-Shear and upwards.*

[10 entries, none absent.]

- 1431 I. (£15).—SIR J. H. HEATHCOTE-AMORY, Bt., Knightshayes Court, Tiverton, for Royal Windsor, born Feb. 14, 1888.
 1429 II. (£10).—SIR J. H. HEATHCOTE-AMORY, Bt., born Feb. 28, 1888.
 1432 III. (£5).—CHARLES NORRIS, Mosshayne, Exeter, born Feb. 13, 1887.
 1426 R. N. & Com.—N. COOK, Chevithorne, Devon, for Jumbo, born Feb. 1887.

Class 138.—*Devon Long-wool Shearling Rams.* [25 entries, 3 absent.]

- 1443 I. (£15).—SIR J. H. HEATHCOTE-AMORY, Bt., Knightshayes Court, Tiverton, born Feb. 28, 1889.
 1438 II. (£10).—N. COOK, Chevithorne, Tiverton, born Feb. 1889.
 1442 III. (£5).—SIR J. H. HEATHCOTE-AMORY, Bt., born Feb. 7, 1889.
 1444 R. N. & H. C.—SIR J. H. HEATHCOTE-AMORY, Bt., born Feb. 21, 1889.
 1457 H. C.—C. G. THORNE, Gurdon, Williton, Som., born about Feb. 8, 1889.
 Com.—CHARLES NORRIS, for No. 1450; A. O. SKINNER, for Nos. 1454, 1455, 1456.

Class 139.—*Pen of Three Shearling Devon Long-wool Ewes, of the same flock.* [8 entries, 1 absent.]

- 1464 I. (£15).—SIR J. H. HEATHCOTE-AMORY, Bt., Knightshayes Court, Tiverton, born Feb. 21, 1889.
 1463 II. (£10).—SIR J. H. HEATHCOTE-AMORY, Bt., born Feb. 28, 1889.
 1461 III. (£5).—N. COOK, Chevithorne, Tiverton, Devon, born Feb. 1889.
 1462 R. N. & H. C.—N. COOK, born Feb. 1889.
 H. C.—C. NORRIS for Nos. 1466, 1467; E. R. B. TORR for No. 1468.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

South Devons.¹

Class 140.—*South Devon Two-Shear Rams.* [4 entries, none absent.]

- 1471 I. (£15.)—JOHN WINTLE, Keynedon Barton, Kingsbridge, born Feb. 1888.
 1470 II. (£10.)—JAMES STOOKE, Sherford, Brixton, Devon, born Feb. 14, 1888.
 1472 III. (£5.)—JOHN WINTLE, Keynedon Barton, Kingsbridge, born Feb. 1888.
 1469 R. N. & H. C.—J. S. HALLETT, Sherford Barton, Devon, born Feb. 1888.

Class 141.—*South Devon Shearling Rams.* [16 entries, none absent.]

- 1482 I. (£15.)—JAMES STOOKE, Sherford, Brixton, Devon, born Feb. 14, 1889.
 1483 II. (£10.)—JAMES STOOKE, Sherford, born Feb. 14, 1889.
 1484 III. (£5.)—JAMES STOOKE, Sherford, born Feb. 14, 1889.
 1485 R. N. & H. C.—JAMES STOOKE, Sherford, born Feb. 14, 1889.
 1477 H. C.—JOHN S. HALLETT, Sherford Barton, born Feb. 1889.
 Com.—JOHN WINTLE for No. 1486; JOHN S. HALLETT for No. 1478.

Class 142.—*Pen of Three Shearling S. Devon Ewes, of the same flock.*
 [7 entries, 1 absent.]

- 1492 I. (£15.)—JAMES STOOKE, Sherford, Brixton, Devon, born Feb. 14, 1889.
 1491 II. (£10.)—JAMES STOOKE, Sherford, born Feb. 14, 1889.
 1490 III. (£5.)—J. S. HALLETT, Sherford Barton, Devon, born Feb. 1889.
 1489 R. N. & H. C.—J. S. HALLETT, born Feb. 1889.

Dartmoor.

Class 143.—*Dartmoor Rams, Two-Shear and upwards.*
 [7 entries, none absent.]

- 1498 I. (£15.)—JAMES DREW, Artiscombe, Tavistock, born about Feb. 20, 1888, bred by H. Hanns, Rowden, Tavistock.
 1499 II. (£10.)—JOHN KNAPMAN, East Ash, South Tawton, Okehampton, Devon, born March 11, 1887.
 1502 III. (£5.)—J. & E. B. YELLAND, Cobham Week, Bridestowe, Devon, born March 3, 1888, bred by Mr. Westcott, Kelly, Devon.
 1497 R. N. & H. C.—JAMES DREW, born about March 10, 1887.
 H. C.—WM. PALMER for No. 1500; WARD & CROWEN for No. 1501.

Class 144.—*Dartmoor Shearling Rams.* [19 entries, 6 absent.]

- 1510 I. (£15.)—JOHN KNAPMAN, East Ash, South Tawton, Okehampton, Devon, born March 1, 1889.
 1516 II. (£10.)—W. PALMER, Yelland, Okehampton, Devon, born April 1, 1889.
 1509 III. (£5.)—JOHN KNAPMAN, born March 16, 1889.
 1518 R. N. & H. C.—WM. PALMER, born April 23, 1890.
 H. C.—THE DIRECTORS OF CONVICT PRISONS for No. 1503; JAMES DREW for No. 1505; WM. LANG for No. 1511; WM. PALMER for No. 1517; H. R. PERKIN for No. 1520.

Class 145.—*Pen of Three Shearling Dartmoor Ewes, of the same flock.*
 [8 entries, 2 absent.]

- 1529 I. (£15.)—J. & E. B. YELLAND, Cobham Week, Bridestowe, Devon, born March 9, 1889.
 1522 II. (£10.)—THE DIRECTORS OF CONVICT PRISONS, Prince Town, Devon, born April 1889.

¹ Prizes given by the Devon County Agricultural Association.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 1523 III. (£5).—JAMES DREW, Artiscombe, Tavistock, born about Feb. 20, 1889.
 1524 R. N. & H. C.—JAMES DREW, Artiscombe, Devon, born about Feb. 20.
 1525 H. C.—JAMES DREW, born about Feb. 20, 1889.
 1528 Com.—WARD & CHOWEN, Burnville, Brentor, Bridestowe, Devon.

Exmoor.

Class 146.—*Exmoor Rams, Two-Shear upwards.*

[2 entries, none absent.]

- 1531 I. (£15).—SIR WM. WILLIAMS, Bt., Heanton, Barnstaple, born Mar. 1888.

Class 147.—*Exmoor Shearling Rams.* [4 entries, none absent.]

- 1535 I. (£15).—SIR WM. WILLIAMS, Bt., Heanton, Barnstaple, born Mar. 1889.
 1534 II. (£10).—SIR WM. WILLIAMS, Bt., born March 1889.

Class 148.—*Pen of Three Shearling Exmoor Ewes, of the same flock.*

[6 entries, none absent.]

- 1539 I. (£15).—R. STRANGER, Court House, N. Molton, born March 1889.
 1538 II. (£10).—RICHARD STRANGER, born March 1889.
 1536 III. (£5).—W. LETHBRIDGE, Wood, Okehampton, born March 4, 1889.
 1537 R. N. & H. C.—WM. LETHBRIDGE, Wood, Okehampton, Devon.
 H. C.—SIR WM. WILLIAMS, Bt., for Nos. 1540, 1541.

PIGS.

Large White Breed.

Class 149.—*Large White Boars, farrowed 1889.* [12 entries, 4 absent.]

- 1546 II. (£5).—DENSTON GIBSON, Rotton Park Farm, Edgbaston, for Pioneer, born June 18, 1889; s. Young Prince, d. Primrose VII. by Gamester II. 319.
 1542 III. (£3).—R. BODDINGTON, Colebrook Hall, Birmingham, born June 2.
 1549 R. N.—JOSEPH NUTTALL, Heywood, Lancashire, for Hero.

Class 150.—*Pens of Three Large White Boar Pigs, farrowed 1890.*

[11 entries, none absent.]

- 1561 I. (£10).—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, born Jan. 1, 1890; s. Holywell Jackie, d. Holywell Jewel.
 1557 II. (£5).—C. E. DUCKERING, The Cliff, Kirton Lindsey, born Jan. 10, 1890; s. Donovan.
 1563 III. (£3).—SANDERS SPENCER, born Jan. 9, 1890; s. Holywell Chief d. Holywell Dot.
 1554 R. N. & H. C.—RICHARD BARTER, St. Ann's Hill, Cork, born Jan. 2, 1890; s. Gipsy King, d. Lady Longside.
 1555 H. C.—RICHARD BODDINGTON, Colebrook Hall.

Class 151.—*Large White Breeding Sows, farrowed before or in 1889.*

[17 entries, 3 absent.]

- 1568 I. (£10).—C. E. DUCKERING, The Cliff, Kirton Lindsey, born in 1887 breeder unknown.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 1577 II. (£5).—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, for Holywell Dame VII., born Jan. 10, 1887; s. Holywell Duke, d. Holywell Dame II.
- 1579 III. (£3).—TOM D. STRICKLAND, Carlton Miniott, Thirsk, born Feb. 16, 1888; s. Lord Worsley, d. Thirsk Lady.
- 1571 R. N. & H. C.—DENSTON GIBSON, for Worsley Queen, born Aug. 1, 1884. H. C.—A. HISCOCK, JUN., for No. 1573; SANDERS SPENCER for No. 1578; TOM D. STRICKLAND for No. 1580.
- 1572 Com.—THE GUARDIANS, PRESCOT UNION, for Whiston 1842.

Class 152.—Pens of Three Large White Sow Pigs, farrowed 1890.

[12 entries, 3 absent.]

- 1591 I. (£10).—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, born Jan. 1, 1890; s. Holywell Dairyman II., d. Holywell Flirt.
- 1589 II. (£5).—JOSEPH NUTTALL, Heywood, Lancashire, born Jan. 2, 1890; s. Billy, d. Niptone.
- 1586 III. (£3).—THE GUARDIANS, PRESCOT UNION, born Jan. 5, 1890; s. Prescott Joe, d. Princess IV.
- 1590 R. N. & H. C.—JOSEPH NUTTALL, born Jan. 10; s. Billy, d. Jumbo. H. C.—DENSTON GIBSON for Nos. 1584, 1585.
- Com.—RICHARD BARTER for No. 1582; E. W. HARCOURT for No. 1587.

Middle White Breed.

Class 153.—Middle White Boars, farrowed in 1889.

[8 entries, 4 absent.]

- 1598 I. (£10).—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, for Holywell Bruce, born Jan. 3; s. Holywell Ponfield, d. Holywell Curly.
- 1601 II. (£5).—A. C. TWENTYMAN, Castlecroft, Wolverhampton, for Silver-sand, born June 11, 1889; s. Don Juan 835, d. Tiny 912.
- 1600 III. (£3).—A. C. TWENTYMAN for Quicksilver, born June 11, 1889; s. Don Juan 835, d. Tiny 912.

Class 154.—Pens of Three Middle White Boar Pigs, farrowed in 1890.

[3 entries, none absent.]

- 1602 I. (£10).—JOSEPH NUTTALL, Heywood, Lancashire, born Jan. 16, 1890; s. Hero, d. Snowdrop.
- 1604 II. (£5).—TOM D. STRICKLAND, Carlton Miniott, Thirsk, born Jan. 5, 1890; s. Bosnell II.
- 1603 R. N.—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts.

Class 155.—Middle White Breeding Sows, farrowed before or in 1889.

[11 entries, 1 absent.]

- 1615 I. (£10).—TOM D. STRICKLAND, Carlton Miniott, Thirsk, Yorks., breeder and age unknown.
- 1612 II. (£5).—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, for Holywell Fitz, born Nov. 5, 1888; s. German Baron.
- 1613 III. (£3).—SANDERS SPENCER, born Jan. 2, 1889.
- 1611 R. N. & H. C.—JOSEPH NUTTALL, Heywood, Lancs., for Betty, H. C.—E. T. CHALK for No. 1605; HON. MRS. MEYNELL INGRAM for No. 1609; JOSEPH NUTTALL for No. 1610.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Class 156.—*Pens of Three Middle White Sow Pigs, farrowed in 1890.*
[5 entries, none absent.]

- 1619 I. (£10.)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, born Jan. 6, 1890; s. Holywell Ponfield.
1618 II. (£5.)—SANDERS SPENCER, born Jan. 2; s. Holywell Silky IV.
1616 III. (£3.)—J. NUTTALL, Heywood, Lancs., born Jan. 16; s. Hero, d. Snowdrop.
1617 H. C.—JOSEPH NUTTALL, born Jan. 3, 1890; s. Hero, d. Lucy.

Small White Breed.

Class 157.—*Small White Boars, farrowed in 1889.*
[7 entries, none absent.]

- 1625 I. (£10.)—THE GUARDIANS, PRESCOT UNION, for Grenton, born Jan. 1889, breeder unknown.
1622 II. (£5.)—HON. D. P. BOUVERIE, Coleshill House, Highworth, for Windsor, born Jan. 11, 1889, bred by the late Earl of Radnor; s. Clanfield 863, d. Shaftesbury.
1623 III. (£3.)—HON. D. P. BOUVERIE, born July 5, 1889, bred by the late Earl of Radnor; s. Prince, d. Shrewsbury III. 1472.
1627 E. N. & H. C.—JOSEPH SAUNDERS, Sutton, Cranborne, for Jim 2nd.
1621 H. C.—HON. D. P. BOUVERIE, born Oct. 29, 1889.

Class 158.—*Pens of Three Small White Boar Pigs, farrowed in 1890.*
[No entry.]

Class 159.—*Small White Breeding Sows, farrowed before or in 1889.*
[6 entries, 2 absent.]

- 1630 I. (£10.)—HON. MRS. MEYNELL INGRAM, Temple Newsam, Leeds, born Sept. 5, 1888.
1632 II. (£5.)—THE COUNTESS OF RADNOR, Longford Castle, Salisbury, for Coleshill Heiress, born Jan. 2, 1889, bred by the late Earl of Radnor; s. Prince, d. Shrewsbury III. 1472.
1631 E. N. & H. C.—JOSEPH NUTTALL, Heywood, Lancs., for Clara, born about Apr. 1888, bred by P. Ascroft, Rufford, Preston; s. Worsley Dandy.
1629 H. C.—HON. MRS. MEYNELL INGRAM, born Sept. 5, 1888.

Class 160.—*Pens of Three Small White Sow Pigs, farrowed in 1890.*
[2 entries.]

- 1635 I. (£10.)—THE COUNTESS OF RADNOR, Longford Castle, Salisbury, born Feb. 7, 1890; s. Prince, d. Moreton.
1634 II. (£5.)—HON. D. P. BOUVERIE, Coleshill House, Highworth, born Jan. 21, 1890; s. Farmer, d. Shrewsbury III. 1472.

Berkshire Breed.

Class 161.—*Berkshire Boars, farrowed in 1889.* [14 entries, 6 absent.]

- 1646 I. (£10, & Champion, £10'.)—T. S. MINTON, Montford, Salop, born Jan. 5, 1889; s. Wicket-keeper 860, d. Montford Beauty 1398.

* Cup, value £10, given by British Berkshire Society for the best Boar in Class 161.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 1637 II. (£5).—NATHANIEL BENJAFIELD, Shorts Green Farm, Motcombe, Dorset, born June 29, 1889, bred by G. W. Homer, Dorchester.
 1649 III. (£3).—J. O. WILLIAMS, Werrington Park, Launceston, born June 15, 1889, bred at Caerhays Castle, St. Austell; s. Viscount Moultsford.
 1640 R. N. & H. C.—JULIUS A. FRICKER, Burton, Mere, Wilts.; s. Random 1848.

Class 162.—*Pens of Three Berkshire Boar Pigs, farrowed in 1890.*
 [6 entries, 3 absent.]

- 1654 I. (£10).—WILLIAM PINNOCK, Littleworth House, Wantage, born Feb. 14, 1890; s. Longstop, d. Taynton Poetess 2384.
 1651 II. (£5).—JULIUS A. FRICKER, Burton, Mere, Wilts, born Jan. 3, 1890; s. King of the West 2181, d. Bright II. 2136.
 1650 R. N.—N. BENJAFIELD, Shorts Green Farm, Motcombe, born Jan. 2.

Class 163.—*Berkshire Breeding Sows, farrowed before or in 1889.*
 [19 entries, 6 absent.]

- 1661 I. (£10, & Champion).—J. A. FRICKER, Burton, Mere, Wilts, born Jan. 2,
 1666 II. (£5).—EDMUND HAYTER, West Woodyates Manor, Handley, Wilts. born March 4, 1889; s. Lord Carzon 2012, d. Emma 1358.
 1671 III. (£3).—JAMES LAWRENCE, Stall Pitts Farm, Shrivenham, Berks, for Painted Lady, born January 9, 1889; s. Paragon, d. Lady Docia.
 1664 R. N. & H. C.—A. S. GIBSON, Springhill, Bulwell, Notts, for Naomi.
 H. C.—N. BENJAFIELD for No. 1657; J. P. KING for No. 1670; W. PINNOCK for No. 1672.
 Com.—E. BURBIDGE for Nos. 1658, 1659; R. FOWLER for No. 1660; DENSTON GIBSON for No. 1663; E. HAYTER for No. 1665; J. P. KING for No. 1668.

Class 164.—*Pens of Three Berkshire Sow Pigs, farrowed in 1889.*
 [7 entries, 4 absent.]

- 1675 I. (£10).—NATHANIEL BENJAFIELD, Shorts Green Farm, Motcombe, Dorset, born January 6, 1890.
 1680 II. (£5).—ALFRED NAPIER, Heatherton Grange, Bradford, Taunton, born January 12, 1890; s. Wooton 2253, d. Gipsy.
 1676 R. N.—JULIUS A. FRICKER, Burton, Mere, Wilts; s. King of the West.

Any other Black Breed.

Class 165.—*Boars, farrowed in 1889.* [11 entries, none absent.]

- 1686 I. (£10).—W. S. NORTHEY, Tinhay, Lifton, Devon, born February 3, 1889; s. Hero 661, d. Queen 3rd 1064.
 1685 II. (£5).—THE DUKE OF HAMILTON & BRANDON, K.T., Easton Park, for Emperor 1197, born January 17, 1889; s. Tommy 455, d. Empress 612.
 1690 III. (£3).—THE EARL OF PORTSMOUTH, Eggesford House, Wembworthy, Devon, born May 22, 1889; s. Duke, d. Rose.

¹ Cup value £10 given by British Berkshire Society for the best Sow in Class 168.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

- 1691 **R. N. & H. C.**—THE EARL OF PORTSMOUTH, born January 7, 1889.
H. C.—THE DUKE OF HAMILTON & BRANDON, K.T., for No. 1684,
 The Prince; **V. S. NORTHEY** for Nos. 1687, 1688; **GEORGE PETTIT**
 for No. 1689, Little Wonder.
 1683 **Com.**—**W. F. COLLIER**, Woodtown, Horrabridge, Devon, born Oct. 31.

Class 166.—*Pens of Three Boar Pigs, farrowed in 1890.* [2 entries.]

- 1693 **I.** (£10.)—THE DUKE OF HAMILTON & BRANDON, K.T., Easton Park,
 Wickham Market, born February 1, 1890; *s.* Dartmoor, *d.* Countess III.
 1694 **R. N.**—**GEO. PETTIT**, Friston, Saxmundham; *s.* Easton, *d.* Primrose.

Class 167.—*Breeding Sows, farrowed before or in 1889.*

[14 entries, 1 absent.]

- 1701 **I.** (£10.)—**W. S. NORTHEY**, Tinhay, Lifton, Devon, born February 3,
 1889; *s.* Hero 661, *d.* Queen 3rd 1064.
 1702 **II.** (£5.)—**W. S. NORTHEY**, born February 3, 1889; *s.* Hero 661, *d.*
 Queen 3rd 1064.
 1703 **III.** (£3.)—**W. S. NORTHEY**, born February 3, 1889, *s.* Hero 661, *d.*
 Queen 3rd 1064.
 1705 **R. N. & H. C.**—**GEORGE PETTIT**, Friston, Saxmundham; *s.* Danger, *d.* Rose.
H. C.—**W. F. COLLIER** for Nos. 1695, 1696; **LORD DUNBOYNE** for
 Nos. 1697, 1698; **THE DUKE OF HAMILTON & BRANDON**, K.T., for Nos.
 1699, 1700; **A. A. PARTRIDGE** for No. 1704; **THE EARL OF PORTS-**
MOUTH for Nos. 1707, 1708.

Class 168.—*Pens of Three Sow Pigs, farrowed in 1890.* [3 entries.]

- 1711 **I.** (£10.)—THE EARL OF PORTSMOUTH, Eggesford House, Wemb-
 worthy, Devon, born January 6, 1890; *s.* Duke, *d.* Rose.
 1710 **II.** (£5.)—**GEORGE PETTIT**, Friston, Saxmundham, born January 24,
 1890; *s.* Easton, *d.* Patty.
 1709 **R. N.**—THE DUKE OF HAMILTON AND BRANDON, K.T.; *s.* Dartmoor.

Tamworth Breed.

Class 169.—*Tamworth Boars, farrowed in 1889.*

[12 entries, none absent.]

- 1717 **I.** (£10.)—**J. H. JORDAN**, Clifford Hill, Stratford-on-Avon, for Argandal,
 born May 31, 1889; *s.* Nepos, *d.* Old Sweep.
 1713 **II.** (£5.)—**AYLESBURY DAIRY CO., LIM.**, Horsham, for Stammerham
 Jim, born June 8, 1889; *s.* Jumbo 1153, *d.* Lady Wallace 2028.
 1712 **III.** (£3.)—**AYLESBURY DAIRY CO., LIM.**, for Dick Praters, born Sep-
 tember 6, 1889; *s.* Dickie 635, *d.* Lady Praters 1514.
 1720 **R. N. & H. C.**—**W. SERPELL**, G. Kellow, Polperro, Cornwall, for Wolsey.

Class 170.—*Pens of Three Tamworth Boar Pigs, farrowed in 1890.*

[8 entries, 2 absent.]

- 1731 **I.** (£10.)—**R. N. SUTTON-NELTHORPE**, Scawby Hall, Brigg, born Jan. 8.
 1727 **II.** (£5.)—**RICHARD BARTER**, St. Ann's Hill, Cork, born Feb. 8, 1890;
s. Red Grant, *d.* Newcastle Queen.
 1724 **R. N.**—**AYLESBURY DAIRY CO., LIM.**; *s.* Dickie 635, *d.* Lady Wallace.

[Unless otherwise stated, each animal named below was "bred by exhibitor."]

Class 171.—*Tamworth Breeding Sows, farrowed before or in 1889.*
[23 entries, 3 absent.]

- 1751 I. (£10).—JOHN NORMAN, JUN., Cliff House, Tamworth, & JOSEPH NORMAN, Nether Whitacre, Coleshill, born January 5, 1889; s. Newcastle Hero 889, d. Red Queen 2062.
- 1748 II. (£5).—W. H. MITCHELL, Elmdene, Kenilworth, for Nana, born June 13, 1889; s. Nepos 1165, d. Drayton Queen.
- 1740 III. (£3).—W. E. BRYMER, Ilington Ho., Dorchester, for Susan, born April 19, 1889, bred by Lord Ashburton; s. Christian, d. Vain.
- 1742 R. N. & H. C.—EGBERT DE HAMEL, Middleton Hall, Tamworth, for Middleton Madcap 2864, born February 6, 1889; s. Newcastle Hero 889, d. Middleton May 1526.
- H. C.—W. E. BRYMER for No. 1741, Sarah; R. IBBOTSON for Nos. 1744, Rosa, 1745, Knowle Ruby; G. T. WHITFIELD for No. 1753.
- Com.—AYLESBURY DAIRY CO., LIM., for Nos. 1732, 1734, 1735, 1736; R. BARTER, for No. 1737; R. BODDINGTON, for No. 1739; EGBERT DE HAMEL, for No. 1743; R. IBBOTSON, for No. 1746; W. H. MITCHELL, for Nos. 1747, 1749; W. SERPELL, for No. 1752; G. T. WHITFIELD, for No. 1754.

Class 172.—*Pens of Three Tamworth Sow Pigs, farrowed in 1890*
[10 entries, none absent.]

- 1762 I. (£10).—JOHN NORMAN, JUN., Cliff House, Tamworth, & JOSEPH NORMAN, Nether Whitacre, Coleshill, born January 2, 1890; s. The Swell 1657, d. Sally 564.
- 1764 II. (£5).—G. T. WHITFIELD, Colebridge, Glos., born Feb. 15, 1890, bred by R. Ibbotson, Knowle; s. Royal George 1175, d. Knowle Ruby 2024.
- 1760 III. (£3).—ROBERT IBBOTSON, Knowle, Birmingham, born Jan. 3, 1890; s. Royal George 1175, d. Whitacre Duchess.
- 1758 R. N. & H. C.—RICHARD BARTER, St. Ann's Hill, Cork, born Feb. 8. Com.—AYLESBURY DAIRY CO., LIM., for Nos. 1755, 1756, 1757; EGBERT DE HAMEL, for No. 1759; R. IBBOTSON, for No. 1761; R. N. SUTTON-NELTHORPE, for No. 1763.

POULTRY.

By "Cock," "Hen," "Drake," "Duck," "Gander" and "Goose," are meant birds hatched before January 1st, 1890; and by "Cockerel," "Pullet," "Young Drake," and "Duckling," are meant birds hatched in 1890, previously to June 1st.

FOWLS.

Dorkings.

Class 173.—*Coloured Dorking Cocks.* [6 entries, 1 absent.]

- 6 I. (£2).—W. S. PINSENT, Rose Hill, Newton Abbot, Devon.
- 1 II. (£1).—ROBERT CHEESMAN, Westwell, Ashford, Kent.
- 4 III. (10s.).—ARTHUR C. MAJOR, The Firs, Langley, Bucks, hatched 1888.
- 3 R. N.—R. B. CURTEIS, Ashenden, Tenterden, Kent; hatched 1888.

Class 174.—Coloured Dorking Hens. [8 entries, none absent.]

- 13 I. (£2.) and 14 II. (£1.)—W. S. PINSENT, Rose Hill, Newton Abbot.
 7 III. (10s.)—ROBERT CHEESMAN, Westwell, Ashford, Kent, 3 years old.
 11 R. N. & H. C.—A. C. MAJOR, The Firs, Langley, Bucks, hatched 1887.
 8 H. C.—A. K. CRICHTON, Estates Office, Glamis, N.B., hatched 1888.

Class 175.—Coloured Dorking Cockerels. [9 entries, none absent.]

- 23 I. (£2.)—W. S. PINSENT, Rose Hill, Newton Abbot, Devon.
 18 II. (£1.)—R. B. CURTEIS, Ashenden, Tenterden, Kent, hatched Jan.
 21 III. (10s.) and 22 R. N. & H. C.—E. W. PARKER, Skirwith Abbey, Carlisle.

Class 176.—Coloured Dorking Pullets. [11 entries, none absent.]

- 32 I. (£2.)—W. S. PINSENT, Rose Hill, Newton Abbot, Devon.
 33 II. (£1.) and 34 III. (10s.)—JOHN WHITE, Warlaby, Northallerton.
 27 R. N. & H. C.—A. K. CRICHTON, Estates Office, Glamis, N.B., hatched Jan. 2.
 H. C.—MRS. HIND for No. 29; EDWARD W. PARKER for No. 30.
 Com.—R. B. CURTEIS for No. 28; EDWARD W. PARKER for No. 31.

Class 177.—Silver Grey Dorking Cocks. [9 entries, 3 absent.]

- 40 I. (£2.)—JOSEPH PETTIPHER, Woodway Ho., Banbury, over 1 year old.
 38 II. (£1.)—JAMES HAYHURST, Vine Ho., Milnthorpe, Westmoreland.
 42 III. (10s.)—G. T. WHITFIELD, Colebridge, Gloucester, over 1 year old.
 39 R. N. & H. C.—ARTHUR C. MAJOR, The Firs, Langley, Bucks.
 37 H. C.—MRS. DICK, Hund How, Kendal.

Class 178.—Silver Grey Dorking Hens. [10 entries, 1 absent.]

- 49 I. (£2.)—J. ROBERTSON, Gordon Castle, Fochabers, N.B., hatched Feb. 1888.
 52 II. (£1.)—G. T. WHITFIELD, Colebridge, Gloucester, over 1 year old.
 47 III. (10s.)—MRS. DIK, Hund How, near Kendal, hatched 1889.
 51 R. N. & H. C.—MRS. WACHER, Woodnesborough, Sandwich, Kent.
 46 H. C.—JAMES CLUNAS, 74 High Street, Elgin.

Class 179.—Silver Grey Dorking Cockerels. [9 entries, 2 absent.]

- 59 I. (£2.)—J. ROBERTSON, Gordon Castle, Fochabers, N.B., hatched Jan.
 62 II. (£1.)—LADY WILSON, Chillingham Barns, Belford, hatched Jan.
 58 III. (10s.)—J. ROBERTSON, Gordon Castle, Fochabers, N.B., hatched Jan.
 54 R. N. & H. C.—J. CLUNAS, 74 High Street, Elgin.
 61 H. C.—MRS. WACHER, Woodnesborough, Kent, hatched Jan. 20.

Class 180.—Silver Grey Dorking Pullets. [11 entries, 1 absent.]

- 73 I. (£2.)—LADY WILSON, Chillingham Barns, Belford, hatched Jan.
 63 II. (£1.)—JAMES CLUNAS, 74 High Street, Elgin, hatched Feb. 8.
 71 III. (10s.)—MRS. WACHER, Woodnesborough, Kent, hatched Jan. 20.
 70 R. N. & H. C.—JAMES ROBERTSON, Gordon Castle, Fochabers, N.B.
 H. C.—ARTHUR C. MAJOR for No. 68; JAMES ROBERTSON for No. 69; MRS. WACHER for No. 72.

Class 181.—White or any other variety Dorking Cocks.

[7 entries, none absent.]

- 78 I. (£2.)—JOSEPH PETTIPHER, Woodway Ho., Banbury, over 1 year old.
 74 II. (£1.)—A. E. W. DABBY, Little Ness, Shrewsbury, over 1 year old.
 79 III. (10s.)—P. WILSON, Colvinston, Annbank, Ayrshire, 2 years old.
 75 R. N. & H. C.—A. E. W. DABBY, Little Ness, Shrewsbury.
 80 H. C.—REV. R. S. S. WOODGATE, Pembury Hall, Tunbridge Wells.

Class 182.—*White or any other variety Dorking Hens.*

[6 entries, none absent.]

- 81 I. (£2.)—A. E. W. DARBY, Little Ness, Shrewsbury, over 1 year old.
83 II. (£1.)—C. A. GOSNELL, The Park, Feltham, hatched 1889.
85 III. (10s.)—JOSEPH PETTIPHER, Woodway Ho., Banbury, over 1 year.
82 B. N. & H. C.—A. E. W. DARBY, over 1 year old.

Class 183.—*White or any other variety Dorking Cockerels.*

[6 entries, none absent.]

- 87 I. (£2.) and 88 II. (£1.)—A. E. W. DARBY, Little Ness, Shrewsbury.
92 III. (10s.) and 91 B. N. & H. C.—REV. R. S. S. WOODGATE, Pembury Hall, Tunbridge Wells.

Class 184.—*White or any other variety Dorking Pullets.*

[4 entries, none absent.]

- 93 II. (£1.)—ALFRED E. W. DARBY, Little Ness, Shrewsbury.
95 III. (10s.)—JOSEPH PETTIPHER, Woodway House, Banbury.
96 B. N.—REV. R. S. S. WOODGATE, Pembury Hall, Tunbridge Wells.

Game.

Class 185.—*Old English Game Cocks.* [15 entries, 2 absent.]

- 109 I. (£2.)—J. W. SIMPSON, Abbey Town, Silloth, Cumberland, hatched 1888.
98 II. (£1.)—EDWARD BARNES, Fern Bank, Godalming, hatched 1889.
101 III. (10s.)—JOHN BROUGH, 22, London Road, Carlisle.
105 B. N. & H. C.—MRS. JONES, Oakley, Claverton Down, Bath.
108 H. C.—WILLIAM LOBEZ, JUN., St. Rudeaux, near Saltash.

Class 186.—*Old English Game Hens.* [16 entries, 3 absent.]

- 126 I. (£2.)—THOMAS ROPER, Wetheral, Carlisle, hatched Mar. 16, 1887.
123 II. (£1.)—MRS. JONES, Oakley, Claverton Down, Bath, hatched Apr. 1888.
127 III. (10s.)—J. W. SIMPSON, Abbey Town, Silloth, hatched Apr. 1888.
113 B. N. & H. C.—BROUGH & JACKSON, 22, London Road, Carlisle.
117 H. C.—JOHN BROUGH, 22, London Road, Carlisle.

Class 187.—*Old English Game Cockerels.* [8 entries, none absent.]

- 128 I. (£2.) and 129 II. (£1.)—JOHN BROUGH, 22, London Road, Carlisle.
135 III. (10s.)—J. W. SIMPSON, Abbey Town, Silloth, Cumberland, hatched Feb. 4.
131 B. N.—MISS MAY DOLBEN, Ipsley Rectory, Redditch, hatched Jan. 6.

Class 188.—*Old English Game Pullets.* [7 entries, none absent.]

- 136 I. (£2.) and 137 II. (£1.)—JOHN BROUGH, 22, London Road, Carlisle.
138 III. (10s.)—BROUGH & JACKSON, 22, London Rd., Carlisle, hatched Feb. 10.
139 B. N.—JOHN GRAHAM, Caldbeck, Wigton, Cumberland, hatched Feb.

Class 189.—*Indian Game Cocks.* [10 entries, none absent.]

- 145 I. (£2.)—JOHN FRAYN, St. Stephens, Launceston, over 6 months old.
144 II. (£1.)—JOHN CROSS, 59, Richmond Street, Plymouth, hatched 1888.
149 III. (10s.)—C. RADFORD, Barnstaple Street, Winkleigh, N. Devon.
150 B. N. & H. C.—ERNEST STRIKE, Hawks Tor View, Launceston.
H. C.—JAMES FRAYNE for No. 146; HENRY PAYNTER for No. 147
JOHN POMBOY for 148; G. T. WHITFIELD for No. 151.

No First Prize awarded.

Class 190.—Indian Game Hens. [14 entries, none absent.]

- 157 I. (£2).—JAMES FRAYNE, Pipus Pool, Launceston.
 156 II. (£1).—JOHN FRAYN, St. Stephens, Launceston, over 6 months old.
 166 III.—G. T. WHITFIELD, Colebridge, Gloucester, over 1 year old.
 161 B. N. & H. C.—JOHN POMROY, Fore Street, Callington, Cornwall.
 H. C.—JOHN CROSS for No. 155; JOB PICKARD for No. 160; C. RADFORD for No. 162.
 Com.—G. T. WHITFIELD for No. 165.

Class 191.—Indian Game Cockerels. [8 entries, none absent.]

- 171 I. (£2.) and 172 II. (£1.).—A. H. HAWKEY, Wadebridge, Cornwall.
 170 III. (10s.).—JAMES FRAYNE, Pipus Pool, Launceston.
 173 B. N.—C. RADFORD, Barnstaple St., Winkleigh, N. Devon, hatched Jan.

Class 192.—Indian Game Pullets. [7 entries, none absent.]

- 179 I. (£2).—A. H. HAWKEY, Wadebridge, Cornwall.
 177 II. (£1.).—JOHN FRAYN, St. Stephens, Launceston.
 178 III. (10s.).—JAMES FRAYNE, Pipus Pool, Launceston.
 180 B. N. & H. C.—C. RADFORD, Barnstaple St., Winkleigh, N. Devon.
 176 H. C.—JOHN FRAYN, St. Stephens, Launceston.

French.

Class 193.—French Cocks. [8 entries, none absent.]

- 184 I. (£2.).—J. H. BRODRICK, Attleboro' Farm, Water Orton, Warwickshire, over 2 years old.
 187 II. (£1.).—S. W. THOMAS, Glasfryn, Cockett, Swansea, over 1 year old.
 189 III. (10s.).—FRANCIS VALPY, St. Heliers, Jersey, hatched March 1889.
 183 B. N. & H. C.—J. AINSWORTH, Highbank, Darwen, hatched June 1889.
 H. C.—S. W. THOMAS for No. 186; FRANCIS VALPY for No. 188.

Class 194.—French Hens. [7 entries, none absent.]

- 194 I. (£2.).—S. W. THOMAS, Glasfryn, Cockett, Swansea, over 1 year old.
 192 II. (£1.).—WILLIAM CANNAN, Norwood, Crosshills, near Keighley.
 196 III. (10s.).—FRANCIS VALPY, St. Heliers, Jersey, hatched Mar. 1889.
 191 B. N. & H. C.—J. AINSWORTH, Highbank, Darwen.
 195 H. C.—FRANCIS VALPY, St. Heliers, Jersey.

Class 195.—French Cockerels. [6 entries, 1 absent.]

- 202 I. (£2.) and 201 II. (£1.).—F. VALPY, St. Heliers, Jersey, hatched March.
 200 III. (10s.).—CHRISTOPHER SAINTY, Old Windsor, hatched Jan. 2.
 197 B. N.—J. AINSWORTH, Highbank, Darwen, Lancashire, hatched Feb.

Class 196.—French Pullets. [5 entries, none absent.]

- 204 I. (£2.).—REV. F. COOKE, Chingunford Rectory, Aston-on-Clun, hatched Jan.
 203 II. (£1.).—J. AINSWORTH, Highbank, Darwen, hatched March.
 206 III. (10s.).—FRANCIS VALPY, St. Heliers, Jersey, hatched March.
 205 B. N.—CHRISTOPHER SAINTY, Old Windsor, Berks, hatched Jan. 2.

Brahmas.

Class 197.—Brahma Cocks. [7 entries, none absent.]

- 214 I. (£2.).—G. H. WOOD, The Cottage, Iwer Heath, Uxbridge.
 212 II. (£1.).—E. SCAMMELL, Hilperton, Trowbridge, hatched April 1887.

- 209 III. (10s.)—R. HOLLAND, Brahma Lodge, Buckingham, hatched, 1888.
 213 B. N. & H. C.—J. C. WARREN, St. Paul's Schools, Paddington.
 211 Com.—W. A. ROBINSON, Wellclose, Bradford-on-Avon.

Class 198.—*Brahma Hens.* [5 entries, 2 absent.]

- 216 I. (£2.)—R. HOLLAND, Brahma Lodge, Buckingham, hatched 1888.
 219 II. (£1.)—G. H. WOOD, The Cottage, Iver Heath, Uxbridge.
 217 III. (10s.)—E. KENDRICK, JUN., Weeford Ho., Lichfield, hatched 1888.

Class 199.—*Brahma Cockerels.* [9 entries, none absent.]

- 224 I. (£2.) and 225 II. (£1.)—REV. HAROLD BURTON, Pauls Vicarage, Whitechurch, Salop, hatched Jan. 2.
 227 III. (10s.)—R. HOLLAND, Brahma Lodge, Buckingham.
 226 B. N.—ROBERT BUTTERFIELD, Nafferton Hall, Hull, hatched Jan. 3.

Class 200.—*Brahma Pullets.* [10 entries, none absent.]

- 229 I. (£2.)—J. BROOKE, Bingley Rd., Heaton, Bradford, Yorks., hatched Jan.
 231 II. (£1.)—REV. H. BURTON, Pauls, Whitechurch, Salop, hatched Jan. 2.
 234 III. (10s.)—R. HOLLAND, Brahma Lodge, Buckingham.
 237 B. N. & H. C.—J. C. WARREN, St. Paul's Schools, Paddington.
 H. C.—REV. H. BURTON, for No. 232; R. BUTTERFIELD for No. 233.
 Com.—JOHN BROOKE for No. 230.

Cochins.

Class 201.—*Cochin Cocks.* [13 entries, 1 absent.]

- 244 I. (£2.)—G. H. PROCTER, Flass House, Durham.
 245 II. (£1.) and 246 III. (10s.)—MRS. SCRIVEN, Normandy Villa, Shipley, hatched June 1888.
 251 B. N. & H. C.—G. H. WOOD, The Cottage, Iver Heath, Uxbridge.
 H. C.—R. HOLLAND for No. 242; EBENEZER SNELL for Nos. 247, 248.
 Com.—PERCY WELLINGTON for No. 249.

Class 202.—*Cochin Hens.* [3 entries, none absent.]

- 254 I. (£2.)—G. H. PROCTER, Flass House, Durham.
 253 II. (£1.)—R. HOLLAND, Brahma Lodge, Buckingham, hatched 1888.
 252 III. (10s.)—JAMES F. CARTER, Rottington Hall, St. Bees, Carnforth.

Class 203.—*Cochin Cockerels.* [7 entries, none absent.]

- 257 I. (£2.)—MISS ROUSE, Lanlivery, Lostwithiel, Cornwall, hatched Jan. 6.
 261 II. (£1.)—G. H. WOOD, The Cottage, Iver Heath, Uxbridge, hatched Feb.
 258 III. (10s.)—MISS ROUSE, Lanlivery, Lostwithiel, hatched Jan. 6.
 255 B. N. & H. C.—R. HOLLAND, Brahma Lodge, Buckingham.
 260 Com.—J. A. SMITH, Froe, St. Anthony, Portscatho, Cornwall.

Class 204.—*Cochin Pullets.* [8 entries, 1 absent.]

- 268 I. (£2.)—TOM SOWERBY, Elm Road, Cleethorpes, Grimsby, hatched Jan. 2.
 266 II. (£1.)—MRS. SCRIVEN, Normandy Villa, Shipley, hatched Jan.
 265 III. (10s.)—MISS ROUSE, Lanlivery, Lostwithiel, Cornwall, hatched Jan. 6.
 269 B. N. & H. C.—A. J. E. SWINDELL, Fernhill Heath, Worcester.
 267 H. C.—J. A. SMITH. Com.—R. HOLLAND for 262.

Langshans.

Class 205.—*Langshan Cocks*. [15 entries, 2 absent.]

- 274 I. (£2).—REV. G. T. LAYCOCK, Terwick Rectory, Petersfield.
 271 II. (£1).—G. FIELDER, 28, Hill Road, Wimbledon, hatched March 1889.
 276 III. (10s.).—F. O. PIERCY, The Elms, Lowthorpe, Hull, hatched 1889.
 280 R. N. & H. C.—CHARLES SEABROOKE, The Echoes, Grays, Essex.
 H. C.—G. E. LOCKYEAR for No. 275; PHILLIPS & ANDREW for No. 277;
 REV. R. T. THORNTON for No. 283.

Class 206.—*Langshan Hens*. [16 entries, 2 absent.]

- 299 I. (£2).—H. WALLIS, Northend Warley, Brentwood, hatched 1889.
 289 II. (£1).—REV. G. T. LAYCOCK, Terwick Rectory, Petersfield, Hants.
 285 III. (10s.).—REV. A. C. DAVIES, Antingham, N. Walsham, hatched 1888.
 294 R. N. & H. C.—J. L. ROBY, South View, Chorley, Lancs., hatched 1889.
 H. C.—F. O. PIERCY for No. 291; RICHARD THOMPSON for No. 298.
 Com.—CHARLES SEABROOKE for No. 296.

Class 207.—*Langshan Cockerels*. [9 entries, none absent.]

- 309 I. (£2).—WILLIAMS & HICKS, Dean Lane, Bedminster, hatched Jan. 23.
 307 II. (£1).—J. W. WALKER, Oxford Lodge, Henley-on-Thames, hatched Jan. 20.
 305 III. (10s.).—F. TANDY, Sandhurst Road, Gloucester, hatched Jan. 2.
 304 R. N. & H. C.—REV. A. C. DAVIES, Antingham Rectory, North Walsham.
 308 H. C.—HARRY WALLIS, Northend Warley, Brentwood, hatched Jan.

Class 208.—*Langshan Pullets*. [9 entries, none absent.]

- 310 I. (£2).—PHILIP L. BENSON, M.D., The Elms, Steeple Claydon, Winslow, hatched Jan. 15.
 313 II. (£1).—R. S. MARSDEN, Bashall Eaves, Clitheroe, hatched Jan. 9.
 315 III. (10s.).—F. TANDY, Sandhurst Road, near Gloucester, hatched Jan. 6.
 318 R. N. & H. C.—H. WALLIS, Northend Warley, Brentwood, Essex.
 317 H. C.—J. W. WALKER, Oxford Lodge, Henley-on-Thames.

Wyandottes.

Class 209.—*Wyandotte Cocks*. [10 entries, 1 absent.]

- 324 I. (£2).—J. HITCHMAN, M.D., The Laurels, Fairford, Glos., hatched 1889.
 322 II. (£1).—MRS. FRANKLIN, Syston Old Hall, Grantham, hatched 1889.
 320 III. (10s.).—PHILIP L. BENSON, M.D., The Elms, Steeple Claydon, Winslow, hatched April 1888.
 323 R. N. & H. C.—GEORGE HEAMAN, JUN., Down Farm, Dolton, Devon.
 H. C.—G. T. WHITFIELD for No. 327; A. E. WRAGG for No. 328.

Class 210.—*Wyandotte Hens*. [15 entries, none absent.]

- 343 I. (£2).—A. E. WRAGG, Edensor, Bakewell, hatched April 1889.
 336 II. (£1).—C. A. E. PERFECT, Foston Lodge, York, hatched 1889.
 330 III. (10s.), and 331 R. N. & H. C.—REV. F. COOKE, Chingunford Rectory, Aston-on-Clun, Salop, hatched 1888 and 1889.
 H. C.—THE COUNTESS OF BECTIVE for No. 329; MRS. OLIVER for Nos. 334, 335; R. TERROTT for No. 340; G. T. WHITFIELD for No. 342.

Class 211.—*Wyandotte Cockerels*. [9 entries, none absent.]

- 351 I. (£2).—R. STACEY, Heatherlands, Tilford, Farnham, hatched Jan. 2.
 344 II. (£1).—ARBOT BROTHERS, Hingham, Norfolk, hatched Jan.

- 347 III. (10s.)—MRS. FRANKLIN, Syston Old Hall, Grantham, hatched Jan.
 349 R. N. & H. C.—W. H. SPENCER, Primrose Cottage, Lee Mount, Halifax.
 346 H. C.—O. H. BANTOFT, Whinbergh Park, East Dereham.

Class 212.—Wyandotte Pullets. [10 entries, 1 absent.]

- 357 I. (£2.)—MRS. OLIVER, Manor Ho., Fletton, Peterborough, hatched Jan. 21.
 355 II. (£1.)—REV. F. COOKE, Chingunford, Aston-on-Clun, hatched Jan.
 354 III. (10s.)—C. H. BANTOFT, Whinbergh Park, E. Dereham, hatched Feb. 14.
 359 R. N. & H. C.—MRS. SANDFORD, Sandford Hall, Prees, Whitchurch, Salop.
 356 H. C.—MRS. FRANKLIN. Com.—ALBERT E. WRAGG for 362.

Plymouth Rocks.

Class 213.—Plymouth Rock Cocks. [15 entries, 2 absent.]

- 368 I. (£2.)—MRS. COOPER, Bulwell Hall, Notts, hatched March 4, 1889.
 376 II. (£1.)—R. STAINTHORP, Nipe Howe Farm, Hawsker, Whitby, Yorks., hatched May 1888.
 363 III. (10s.)—ABBOT BROS., Hingham, Norfolk, hatched July 1889.
 371 R. N. & H. C.—G. HEAMAN, JUN., Down Farm, Dolton, N. Devon.
 H. C.—MRS. BAYLDON for No. 366; SYDNEY LAKE for No. 372;
 WILLIAM PARKER for No. 373.

Class 214.—Plymouth Rock Hens. [12 entries, none absent.]

- 379 I. (£2.)—R. BUTTERFIELD, Nafferton Hall, Hull, over 3 years old.
 381 II. (£1.)—W. H. OGDEN, Crown Hill, Devon, hatched Mar. 5, 1888.
 383 III. (10s.)—JOHN HASTLEY, Gillroyd, Morley, Yorkshire.
 384 R. N. & H. C.—G. HEAMAN, JUN., Down Farm, Dolton, N. Devon.

Class 215.—Plymouth Rock Cockere's. [17 entries, none absent.]

- 396 I. (£2.)—R. BUTTERFIELD, Nafferton Hall, Hull, hatched Jan. 8.
 397 II. (£1.)—MRS. COOPER, Bulwell Hall, Notts, hatched Jan. 14.
 399 III. (10s.)—P. A. FARRER, Petygards, Swaffham, hatched Feb.
 R. N. & H. C.—MRS. AINSWORTH for No. 393, and H. C. for No. 392.

Class 216.—Plymouth Rock Pullets. [20 entries, none absent.]

- 413 I. (£2.)—MRS. COOPER, Bulwell Hall, Notts, hatched Jan. 14.
 410 II. (£1.)—MRS. AINSWORTH, Harwood, Horrabridge, Devon, hatched Feb.
 418 III. (10s.)—P. A. FARRER, Petygards, Swaffham, hatched Feb.
 419 R. N. & H. C.—MRS. FARRER, Petygards, Swaffham, hatched Feb.
 417 H. C.—W. EVERINGTON. Com.—ABBOT BROS. for Nos. 407, 408.

Minorcas.

Class 217.—Minorca Cocks. [17 entries, none absent.]

- 431 I. (£2.)—J. GLANFIELD, The Riffel, Torquay, hatched April 1888.
 436 II. (£1.)—A. G. PITTS, The Firs, Highbridge, Som., hatched May 1888.
 434 III. (10s.)—T. T. MARTIN, Ivy Ho., St. Philip's Marsh, Bristol, hatched 1889.
 438 R. N. & H. C.—PROPS. OF HAWKHURST POULTRY YARDS, Bridgwater, hatched 1889.
 H. C.—W. H. STOEYEL for No. 443; Com.—DR. W. B. PAULIN for No. 435.

Class 218.—Minorca Hens. [17 entries, none absent.]

- 457 I. (£2.)—J. PULSFORD, Brook Hays, Withycombe, Devon, hatched July 1889.
 444 II. (£1.)—R. BUTTERFIELD, Nafferton Hall, Hull, 1 year 2 months old.

- 450 III. (10s.)—WILLIAM LEIGHTON, Bridge Street, Preston.
 460 R. N. & H. C.—W. S. STEVENSON, Barnicott, Newton Ferrers, Plymouth.
 H. C.—WM. LEIGHTON for No. 449; ALBERT LEWIS for No. 451; A. G. PITTS for No. 455.

Class 219.—*Minorca Cockerels.* [10 entries, 4 absent.]

- 470 I. (£2.)—PROPER, HAWKHURST POULTRY YARDS, Bridgwater, htd. Jan. 11.
 468 II. (£1.)—C. PAYNE, Truchot Street, Guernsey, hatched Feb. 4.
 467 III. (10s.)—J. W. LABEY, East Lynne, St. Lukes, Jersey, hatched Jan. 13.
 465 R. N. & H. C.—O. GROVES, Bridgwater, Som., hatched Feb. 10.

Class 220.—*Minorca Pullets.* [9 entries, none absent.]

- 476 I. (£2.)—DR. W. B. PAULIN, Creech St. Michael, Taunton, hatched Jan. 2.
 479 II. (£1.)—JOHN SPRY, 12, Mount Pleasant, Hartop Road, St. Mary Church, Torquay, hatched Jan. 16.
 473 III. (10s.)—R. BUTTERFIELD, Nafferton Hall, Hull, hatched Feb. 5.
 474 R. N. & H. C.—J. HUTCHINGS, 15, Gandy Street, Exeter, hatched Jan.
 H. C.—ABBOT BROS. for No. 471; J. W. LABEY for No. 475.

Andalusian.

Class 221.—*Andalusian Cocks.* [8 entries, none absent.]

- 480 I. (£2.)—D. BUTTERFIELD, E. Morton, Bingley, Yorks, age 16 months.
 485 II. (£1.)—E. MERRALL, E. Morton, near Bingley, Yorks, 1 year old.
 483 III. (10s.)—W. F. LE BOUTILLIER, St. Heliers, Jersey, hatched June 1888.

Class 222.—*Andalusian Hens.* [14 entries, none absent.]

- 495 I. (£2.) and 496 II. (£1.)—W. F. LE BOUTILLIER, St. Heliers, htd. May 1888.
 489 III. (10s.)—D. BUTTERFIELD, E. Morton, Bingley, Yorks, age 16 months.
 498 R. N. & H. C.—E. MERRALL, E. Morton, near Bingley, Yorks., 1 year old.
 488 H. C.—REV. E. R. O. BRIDGERMAN, Blymhill Rectory, Shifnal, Salop.

Class 223.—*Andalusian Cockerels.* [9 entries, 1 absent.]

- 507 I. (£2.)—E. MERRALL, East Morton, near Bingley, Yorks., hatched Jan. 26.
 506 II. (£1.)—WILLIAM LEIGHTON, Bridge Street, Preston.
 505 III. (10s.)—W. F. LE BOUTILLIER, St. Heliers, Jersey, hatched Jan. 21.
 508 R. N.—E. MERRALL, East Morton, near Bingley, hatched Jan. 26.

Class 224.—*Andalusian Pullets.* [9 entries, none absent.]

- 517 I. (£2.)—E. MERRALL, East Morton, near Bingley, Yorks., hatched Jan. 26.
 519 II. (£1.)—REV. R. T. THORNTON, Dulcote, Tunbridge Wells, hatched Feb.
 513 III. (10s.)—THOMAS PATTERSON, Grey Stone, Carlisle, hatched Jan. 15.
 515 R. N. & H. C.—WILLIAM LEIGHTON, Bridge Street, Preston.

Leghorns.

Class 225.—*Leghorn Cocks.* [11 entries, none absent.]

- 522 I. (£2.)—A. C. BRADBURY, Nuthall, Nottingham, hatched April 1889.
 524 II. (£1.)—W. CANNAN, Norwood, Crosshills, near Keighley, Yorks.
 526 III. (10s.)—JOHN HURST, South Terrace, Glossop, hatched 1889.
 529 R. N. & H. C.—MRS. SINKIN, Aldermoor, Southampton, hatched 1889.

Class 226.—*Leghorn Hens.* [10 entries, none absent.]

- 532 I. (£2).—A. C. BRADBURY, Nuthall, Nottingham, hatched April 1889.
 536 II. (£1).—JOHN HURST, South Terrace, Glossop, hatched 1889.
 533 III. (10s.).—W. CANNAN, Norwood, Crosshills, near Keighley, Yorks.
 538 R. N. & H. C., and 539 H. C.—JOSEPH PRIDE, Thorverton, Devon.

Class 227.—*Leghorn Cockerels.* [11 entries, none absent.]

- 548 I. (£2).—C. W. KELLOCK, JUN., Highfields Hall, Audlem, Cheshire.
 545 II. (£1).—C. HEATH, Thurgarton Priory, Southwell, Notts, hatched Feb.
 547 III. (10s.).—JOHN HURST, South Terrace, Glossop.
 541 R. N. & H. C.—JOHN BERRY, 40 Aireview Street, Silsden, near Keighley.
 H. C.—ROBERT BUTTERFIELD for No. 542; MRS. SINKINS for No. 550.

Class 228.—*Leghorn Pullets.* [15 entries, none absent.]

- 566 I. (£2).—R. & J. H. WADE, Silsden, Keighley, Yorks., hatched Jan. 12.
 566 II. (£1).—EAST KENT POULTRY FARM, Pluckley, Ashford, hatched Jan.
 561 III. (10s.).—JOHN HURST, South Terrace, Glossop.
 552 R. N. & H. C.—JOHN BERRY, 40 Aireview Street, Silsden, Keighley.
 H. C.—EAST KENT POULTRY FARM for No. 555; CHARLES HEATH for No. 559; C. W. KELLOCK, JUN., for No. 562; MRS. SINKINS for No. 564; W. H. SPENCER for No. 565.

Hamburghs.

Class 229.—*Hamburgh Cocks, any variety.* [10 entries, none absent.]

- 572 I. (£2).—HENRY PICKLES, Kayfield House, Earby, Leeds.
 570 II. (£1).—C. A. KEMBALL, Earl's Acre, Plymouth, hatched Mar. 24, 1889.
 567 III. (10s.).—WILLIAM CANNAN, Norwood, Crosshills, near Keighley.
 574 R. N. & H. C.—T. RYMAN, Theale Board School, Weston-super-Mare.
 H. C.—C. G. J. GILBERT for No. 569; REV. G. T. LAYCOCK for No. 571.

Class 230.—*Hamburgh Hens, any variety.* [7 entries, none absent.]

- 579 I. (£2).—REV. G. T. LAYCOCK, Terwick Rectory, Petersfield.
 580 II. (£1).—HENRY PICKLES, Kayfield House, Earby, Leeds.
 582 III. (10s.), and 583 R. N. & H. C.—LADY WOLSELEY, Wolseley, Stafford, hatched 1888.

Class 231.—*Hamburgh Cockerels, any variety.* [10 entries, 1 absent.]

- 590 I. (£2).—T. RYMAN, Theale Board School, Weston-super-Mare, hatched Feb.
 587 II. (£1).—SAMUEL JACKSON, High Green Farm, Silsden, Keighley, hatched Jan. 15.
 585 III. (10s.).—T. DOWSON, Frosterley, Darlington, hatched Jan. 29.
 592 R. N. & H. C., and 591 H. C.—SPENCER & WEATHERHEAD, Red Lion Hotel, Silsden, Keighley, Yorks., hatched Jan. 10.

Class 232.—*Hamburgh Pullets, any variety.* [11 entries, none absent.]

- 601 I. (£2).—R. RIMMER, Old Post Office, Churchtown, Southport, hatched Jan.
 594 II. (£1).—WM. CANNAN, Norwood, Crosshills, Keighley, hatched Feb. 7.
 604 III. (10s.).—LADY WOLSELEY, Wolseley, Staffs., hatched Jan. 26.
 595 R. N. & H. C.—THOMAS DOWSON, Frosterley, Darlington, hatched Jan. 29.
 599 H. C.—LAKIN & WELCH, 4 Sunrise Villas, North Walsall, Staffs.

Table Fowls.

Class 233.—*Pair of Cockerels of 1890, of any pure breed.*
[6 entries, 1 absent.]

- 605 II. (£1.)—R. B. CURTEIS, Ashenden, Tenterden, Kent, hatched Feb.
610 III. (10s.)—E. C. TUCKER, Carisbrooke Farm, Linkinhorne, hatched Feb.
606 R. N.—MRS. DICK, Hund How, near Kendal, hatched Feb.

Class 234.—*Pair of Pullets of 1890, of any pure breed.*
[7 entries, none absent.]

- 611 I. (£2.)—WILLIAM BRENT, Clampit Farm, Callington, Cornwall.
615 II. (£1.)—MRS. RATTRAY, Kilmorna, Listowel, Co. Kerry, hatched Feb. 3.
612 III. (10s.)—R. B. CURTEIS, Ashenden, Tenterden, Kent, hatched Feb.
617 R. N.—E. C. TUCKER, Carisbrooke Farm, Linkinhorne, Cornwall.

Class 235.—*Pair of Cockerels of 1890, cross from Dorking and any other pure breed.* [1 entry, absent.]

Class 236.—*Pair of Pullets of 1890, cross from Dorking and any other pure breed.* [1 entry.]

- 619 III. (10s.)—P. B. GOVETT, Sideford, St. German's, Cornwall, hatched Jan.

Class 237.—*Pair of Cockerels of 1890, cross from Game and any other pure breed.* [No entry.]

Class 238.—*Pair of Pullets of 1890, cross from Game and any other pure breed.* [1 entry.]

- 620 II. (£1.)—MISS MAY DOLBEN, Ipsley Rectory, Redditch, hatched Feb. 2.
(Indian Game and Dorking.)

DUCKS.**Aylesbury.**

Class 239.—*Aylesbury Drakes and Ducks.* [5 entries, 1 absent.]

- 622 I. (£2.), and 623 II. (£1.)—EBENEZER SNELL, Ketton, Stamford.
625 III. (10s.)—WM. WESTON, 31 Mount Street, Aylesbury, hatched 1889.
621 R. N.—J. W. HEDGES, 40 Castle Street, Aylesbury, hatched 1889.

Class 240.—*Aylesbury Young Drakes and Ducklings.*
[8 entries, none absent.]

- 628 I. (£2.)—WILLIAM WESTON, 31 Mount Street, Aylesbury.
628 II. (£1.)—R. BUTTERFIELD, Nafferton Hall, Hull, hatched Feb. 22.
631 III. (10s.)—J. W. HEDGES, 40 Castle Street, Aylesbury.
629 R. N.—W. BYGOTT, JUN., Rye Hill Farm, Ulceby, Lincolnshire.

Rouen.

Class 241.—*Rouen Drakes and Ducks.* [7 entries, none absent.]

- 634 I. (£2.)—WM. BYGOTT, JUN., Rye Hill Farm, Ulceby, hatched Mar. 1889.
637 II. (£1.)—T. G. HOULTON, South Killingholme, Ulceby, 1 year old.

- 635 III. (10s.)—W. BYGOTT, JUN., Rye Hill Farm, Ulceby, hatched Mar. 1889.
 640 R. N.—LADY WILSON, Chillingham Barns, Belford, Northumberland.
 636 Com.—DAVID GARTON, Golborne, Newton-le-Willows, Lancashire.

Class 242.—*Rouen Young Drakes and Ducklings.* [5 entries, 1 absent.]

- 644 I. (£2.)—T. G. HOULTON, S. Killingholme, Ulceby, hatched April 1.
 641 II. (£1.) and 642 III. (10s.)—W. BYGOTT, JUN., Rye Hill Farm, Ulceby, hatched Jan. 2 and Feb. 28.
 643 R. N.—DAVID GARTON, Golborne, Newton-le-Willows, Lancs.

Pekin.

Class 243.—*Pekin Drakes and Ducks.* [6 entries, 1 absent.]

- 647 I. (£2.)—THOMAS ALLEN, Crookwood, Devizes, Wilts., 1 year old.
 649 II. (£1.)—S. BROWN, 52 Kingsland Road, St. Phillips, Bristol, hatched Feb. 27, 1889.
 646 III. (10s.)—THOMAS ALLEN, Crookwood, Devizes, Wilts., 1 year old.
 651 R. N.—A. W. ROUND, Stanley Park Farm, Sebsley, Stroud.

Class 244.—*Pekin Young Drakes and Ducklings.*

[4 entries, none absent.]

- 652 I. (£2.)—T. ALLEN, Crookwood, Devizes, Wilts., hatched Mar. 2.
 655 II. (£1.)—T. F. HORSLEY, South Grove, Highgate, N., hatched Mar. 18.
 653 III. (10s.)—S. BROWN, 52, Kingsland Road, St. Phillips, Bristol, hatched Mar. 2.
 654 R. N.—FRED DAVIS, Woolashill, Pershore, Worcestershire.

Any Other Useful Breeds.

Class 245.—*Drakes and Ducks.* [5 entries, none absent.]

- 660 I. (£2.)—LADY WILSON, Chillingham Barns, Belford, Northumberland.
 658 II. (£1.)—T. H. STRINGER, Bunce Ct., Otterden, Faversham, hatched April 1888.
 657 III. (10s.)—FRED DAVIS, Woolashill, Pershore, Worcs., hatched 1889.
 659 R. N.—R. TERROT, Woodstone Manor, Peterborough.

Class 246.—*Young Drakes and Ducklings.* [1 entry.]

- 661 II. (£1.)—FRED DAVIS, Woolashill, Pershore, Worcestershire.

Table Ducks.

Class 247.—*Pair of Ducklings of 1890, of any pure breed, sent alive.* [8 entries, none absent.]

- 668 I. (£2.)—MISS M. MOORE, Bisbury Ct., Leominster, hatched April 16.
 666 II. (£1.)—J. W. HEDGES, 40, Castle Street, Aylesbury, hatched April.
 662 III. (10s.)—E. BARNES, Fern Bank, Godalming, Surrey, hatched Feb.
 667 R. N.—J. W. HEDGES, 40, Castle Street, Aylesbury, hatched April.

Class 248.—*Pair of Ducklings of 1890, of a first cross from any pure breed. (Name of breed to be stated.) Sent alive.* [5 entries, none absent.]

- 673 I. (£2.), and 674 II. (£1.)—J. W. HEDGES, 40, Castle Street, Aylesbury, hatched April. (Aylesbury and Pekin.)
 672 III. (10s.)—JOHN D. ELLIS, Dunstone, Yealmpton, Devon, hatched Mar. 23 and 5. (Aylesbury and Pekin.)

Geese.

Class 249.—*Ganders and Geese.* [2 entries.]

- 676 I. (£2.)—DAVID L. PICKEN, Milton Farm, Kirkcudbright, N.B.
 675 II. (£1.)—LORD DUNBOYNE, Greendale, Exeter.

Turkeys.

Class 250.—*Turkey Cocks.* [13 entries, 2 absent.]

- 678 I. (£2.)—MRS. BARNES, Arkleby, Aspatria, Carlisle, hatched May 25, 1888.
 687 II. (£1.)—R. TERROT, Woodstone Manor, Peterborough, hatched May 1889.
 688 III. (10s.)—MRS. WILLIAMS, Hawkstone Hotel, near Shrewsbury.
 689 R. N.—LADY WILSON, Chillingham Barns, Belford, hatched 1888.
 H. C.—LORD DUNBOYNE for No. 680; W. H. MITCHELL for No. 685.
 Com.—THE MARQUIS OF HEADFORT for No. 683.

Class 251.—*Turkey Hens.* [6 entries, none absent.]

- 693 I. (£2.)—MRS. WILLIAMS, Hawkstone Hotel, Shrewsbury, hatched May 188
 690 II. (£1.)—ABBOT BROS., Hingham, Norfolk, over 1 year.
 695 III. (10s.), and 694 R. N.—LADY WILSON, Chillingham Barns, Belford,
 hatched May 1889.

FARM AND DAIRY PRODUCE OF THE UNITED KINGDOM.

Wool.¹Class 252.—*Three Fleeces, Devon Long Wool.* [11 entries.]

- 7 (£4.)—ALFRED C. SKINNER, Pound Farm, Bishops Lydeard, Som.
 H. C.—N. COOK for No. 1; CHARLES NORRIS for No. 5.
 Com.—C. GILES THORNE for No. 9.

Class 253.—*Three Fleeces, South Devon.* [4 entries.]

- 13 (£4.)—JOHN S. HALLETT, Sherford Barton, near Plymouth.
 H. C.—J. S. HALLETT for No. 12; J. STOOKE for Nos. 14, 15.

Class 254.—*Three Fleeces, Dartmoor.* [5 entries.]

- 16 (£4.)—E. F. DAMERELL, Colwell Farm, Egg Buckland, Crown Hill, Devon.
 20 R. N. & H. C.—T. SMERDON, Bullhornstone Farm, South Brent, Devon.

Class 255.—*Three Fleeces, Exmoor.* [2 entries.]

- 22 (£4.)—SIR WILLIAM WILLIAMS, Bt., Heanton, Barnstaple, Devon.

Cheese.

Class 256.—*Three Cheddar Cheeses, not less than 50 lb. each, made in 1889.* [11 entries.]

- 33 I. (£15.)—ALFRED REYNOLDS, Milborne Port, near Sherborne.
 29 II. (£10.)—J. HILLARD, Church Farm, Charlton Musgrove, Wincanton, Som.

- 27 III. (£5.)—HENRY FRANCOIS, Little Burton, Sherborne, Dorset.
 25 B. N.—THEODORE C. CANDY, Woolcombe, Cattistock, Dorset.
 H. C.—W. J. HALL for No. 28. Com.—EDWIN HISCOCK for No. 30.

Class 257.—*Three Cheshire Cheeses, of not less than 40 lb. each, made in 1889.* [4 entries.]

- 37 I. (£15.)—MRS. ANN WALLEY, Bulls Green Farm, Stoke, Nantwich.
 36 II. (£10.)—THOMAS HOULBROOKE, Calvely Farm, Tarporley.
 34 III. (£5.)—HUGH R. DUTTON, Spurstow Lower Hall, Tarporley.

Class 258.—*Six Stilton Cheeses of 1889 make.* [11 entries.]

- 47 I. (£15.)—HENRY MORRIS, Mano Farm, Saxelby, Melton Mowbray.
 43 II. (£10.)—MRS. CHARLOTTE FAIRBROTHER, Beeby, Leicester
 44 III. (£5.)—CHARLES GOODSON, Great Dalby, Melton Mowbray.
 38 B. N. & H. C.—J. BAKER, Willoughby-on-the-Wolds, Loughborough.
 Com.—ALBERT HULL for No. 45; JAMES MORLEY for No. 46.

Class 259.—*Three Cheeses of any British make, made in 1890.*
 [20 entries.]

- 53 I. (£15.)—HENRY CANNON, Milton Clevedon, Evercreech, Somerset.
 57 II. (£10.)—W. J. HALL, Coventry Farm, Wroughton, Swindon.
 52 III. (£5.)—THEODORE C. CANDY, Woolcombe, Cattistock, Dorset.
 59 B. N. & H. C.—THOMAS HOULBROOKE, Calvely Farm, Tarporley.
 H. C.—SIDNEY J. MARTIN for No. 63; ALFRED REYNOLDS for No. 68.
 62 Com.—JOSEPH MARTIN.

Soft Cheese.

Class 260.—*Three Cream Cheeses.* [8 entries.]

- 70 I. (£3.)—MRS. MARY CUSTANCE, Brook Heath, Breamore, Salisbury.
 69 II. (£2.)—EDWIN BROUGH, Wyndyate, near Scarborough.
 71 III. (£1.)—JOHN HARRIS, All Saints Road, Sidmouth, Devon.
 75 B. N. & H. C.—REV. S. H. WILLIAMS, Gt. Linford, Newport Pagnell.
 72 Com.—HON. MRS. CECIL HOWARD, Dutchlands, Great Missenden.

Class 261.—*Three British Soft Cheeses, other than Cream, made from milk, no extra cream added.* [1 entry. No award.]

Butter.

CLASSES 262, 263, AND 264.

Five equal Prizes of £5 each, Five equal Prizes of £3 each.

Class 262.—*Three pounds fresh Butter, absolutely free from salt, made up in pounds.* [63 entries.]

- 104 (£5.)—HON. MRS. CECIL HOWARD, Dutchlands, Great Missenden.
 120 (£5.)—G. F. SNELL, Ebdon Farm, Sidbury, Sidmouth, Devon.
 129 (£5.)—C. C. TUDWAY, The Cedars, Wells, Somerset.
 82 (£3.)—MRS. ELIZA J. BODY, Leigh Hole Farm, Wrington, Somerset.
 87 (£3.)—CATHEDRAL DAIRY CO., Eastgate, Exeter.
 107 (£3.)—WILLIAM LEVERTON, Woolleigh Barton, Beaford, N. Devon.
 108 (£3.)—COLONEL ALEX. C. MACLEAY, Glasshayes, Lyndhurst.
 110 (£3.)—JAMES MORLEY, Sysonby, Melton Mowbray.
 Com.—FRANK WILLAN for No. 133; JOHN WILLIAMS for No. 134.

Class 263.—*Three pounds fresh Butter, slightly salted, made up in pounds.* [62 entries.]

- 145 (£5.)—MRS. ELIZA J. BODY, Leigh Hole Farm, Wrington, Somerset.
 150 (£5.)—JOHN CHANNON, Wishford, Broad Clyst, Devon.
 152 (£5.)—N. COAD, Pengelly Farm, Callington, Cornwall.
 155 (£5.)—MRS. MARY CUSTANCE, Brook Heath, Breamore, Salisbury.
 177 (£5.)—LORD POLTIMORE, Poltimore Park, Exeter.
 166 (£3.)—HON. MRS. CECIL HOWARD, Dutchlands, Great Missenden, Bucks.
 183 (£3.)—G. F. SNELL, Ebdon Farm, Sidbury, Sidmouth.
 186 (£3.)—ROSS MOORE TANNER, Woolbeding, Midhurst, Sussex.
 190 (£3.)—C. C. TUDWAY, The Cedars, Wells, Somerset.
 Com.—HON. MRS. BAILLIE-HAMILTON for No. 141; JOHN BLACKSHAW for No. 144; JOSEPH BRUTTON for No. 147; WM. LETHBRIDGE for No. 170; JAMES MORLEY for No. 173; RICHARD PEARSON for No. 176; JOHN WILLIAMS for No. 197.

Class 264.—*Three pounds of Butter, made from Scalded Cream.*¹
 [33 entries.]

- 203 (£5.)—MRS. ELIZA J. BODY, Leigh Hole Farm, Wrington, Somerset.
 210 (£5.)—N. COAD, Pengelly Farm, Callington, Cornwall.
 213 (£5.)—TOM EMBRY, Elm Tree Farm, Portbury, Somerset.
 220 (£5.)—LORD MONTAGU, Palace House, Beaulieu, Hants.
 224 (£5.)—LORD POLTIMORE, Poltimore Park, Exeter, Devon.
 206 (£3.)—MRS. H. E. BURT, Chew Stoke, Somerset.
 208 (£3.)—JOHN CHANNON, Wishford, Broad Clyst, Devon.
 215 (£3.)—J. W. HALLETT, Legh, Beer Flerris, Roborough, Devon.
 226 (£3.)—SID VALE DAIRY CO., Sidford, Sidmouth, Devon.
 232 (£3.)—JOHN WILLIAMS, Regilbury Park, Winford, Bristol.
 Com.—R. M. TANNER for No. 227; M. J. WILLIAMS for No. 233.

Class 265.—*Three pounds Whey Butter, without any admixture of Fresh Milk or Cream.* [4 entries.]

- 235 I. (£3.)—JOHN BLACKSHAW, Marton, Chelford, Cheshire.
 237 II. (£2.)—M. J. WILLIAMS, North Hill Farm, Chew Stoke, near Bristol.
 236 III. (£1.)—THEODORE O. CANDY, Woolcombe, Cattistock, Dorset.

Class 266.—*One Keg or other Package of Salt Butter, not less than 14 lb. in weight.* [22 entries.]

- 255 I. (£5.)—GARRETT TAYLOR, Trowse House, Norwich.
 250 II. (£3.)—LORD MONTAGU, Palace House, Beaulieu, Hants.
 248 III. (£2.)—ELLIS POWELL JONES, Plas Llanynys, Denbigh.
 249 IV. (£1.)—WILLIAM LETHBRIDGE, Wood, Okehampton, Devon.
 259 R.N. & Com.—JOHN WILLIAMS, Regilbury Park, Winford, Bristol.

CIDER AND PERRY.

Class 267.—*Cask of not less than 18, and not more than 30, gallons of Cider made in the Autumn of 1889.* [23 entries.]

- 265 I. (£5.)—*Herefordshire Fruit*, and 264 II. (£3.)—*Somerset Fruit*, W. F. CHAVE, Moor House, Hereford.
 260 III. (£2.)—REYNOLDS ASHFORD, Monkton, Pinhoe, Exeter.
 275 R. N. & H. C.—THOMAS MAYE, Mount Elwell, Totnes.

¹ Given by the Plymouth Local Committee.

Class 268.—*One Dozen Bottles of Cider made in the Autumn of 1889.*
[20 entries.]

- 284 II. (£3.)—G. L. BOND, Westboro', Coombeinteignhead, Teignmouth.
292 III. (£2.)—WILLIAM GAYMER, Banham, Attleborough, Norfolk.

Class 269.—*One Dozen Bottles of Cider made in any year before 1889.*
[13 entries.]

- 308 I. (£5.)—CHARLES HAM, 78, Fore Street, Exeter.
304 II. (£3.)—H. P. BULMER & Co., Ryelands, Hereford.
315 III. (£2.)—JOHN L. WINTER, Bridgetown, Totnes, Devon.
303 R. N. & Co.—REYNOLDS ASHFORD, Monkton, Pinhoe, Exeter.

Class 270.—*One Dozen Bottles of Perry.* [5 entries.]

- 316 I. (£5.)—*Gloucestershire Fruit*, and 317 II. (£3.)—*Herefordshire Fruit*,
H. P. BULMER & Co., Ryelands, Hereford.
320 III. (£2.)—DANIEL PHELPS, Tibberton, Gloucester.

JAMS AND PRESERVED FRUITS.

Class 271.—*Collection of Jams.* [5 entries.]

- 323 I. (£5.)—EARL OF COVENTRY, Pershore Jam and Pickle Factory.
324 II. (£3.)—JONAS SAVILLE & SONS, 11 Worthington Street, Bradford.
321 III. (£2.)—BRITANNIA FRUIT PRESERVING COMPANY, Tiptree Heath.

Class 272.—*Collection of Fruit Jellies.* [2 entries. No Award.]

Class 273.—*Collection of Bottled Fruits.* [1 entry.]

- 328 I. (£5.)—BRITANNIA FRUIT PRESERVING COMPANY, Tiptree Heath.

Class 274.—*Collection of Preserved Fruits for Dessert Purposes.*
[1 entry. No Award.]

Class 275.—*Collection of Dried or Evaporated Fruits for Cooking Purposes.* [No entry.]

HIVES, HONEY, AND BEE APPLIANCES.²

Class 276.—*Collection of Hives and Appliances.* [2 entries.]

- 331 I. (£2.)—W. P. MEADOWS, Syston, Leicester.
330 II. (£1 10s.)—CHAS. T. OVERTON, Lowfield Apiaries, Crawley, Sussex.

Class 277.—*Observatory Hive stocked with Bees and Queen.*
[2 entries.]

- 333 I. (£1.)—C. T. OVERTON, Lowfield Apiaries, Crawley, Carniolans.

² No First Prize awarded.
Prizes given by the British Bee-keepers' Association.

Class 278.—Best and Most complete Frame-hive for general use unpainted. [4 entries.]

- 334 I. (£1.)—CHAS. REDSHAW, South Wigston, Leicester.
 336 II. (15s.)—CHAS. T. OVERTON, Lowfield Apiaries, Crawley, Sussex.
 337 III. (10s.)—W. P. MEADOWS, Syston, Leicester.

Class 279.—Most complete and inexpensive Frame-hive for Cottager's use, unpainted. [6 entries.]

- 342 II.¹ (15s.)—CHAS. T. OVERTON, Lowfield Apiaries, Crawley. Price 8s. 6d.
 341 III. (10s.)—HUTCHINGS BROS., St. Mary Cray, Kent. Price 6s. 6d.

Class 280.—Honey Extractor. [4 entries.]

- 347 I. (15s.) and 346 II. (10s.)—W. P. MEADOWS, Syston, Leicester.

Class 281.—Pair of Section Racks, completely fitted for use and interchangeable. [5 entries.]

- 351 I. (15s.)—W. P. MEADOWS, Syston, Leicester.
 348 II. (10s.)—CHAS. REDSHAW, South Wigston, Leicester.
 350 III. (5s.)—CHAS. T. OVERTON, Lowfield Apiaries, Crawley, Sussex.

Class 282.—Feeder. [7 entries.]

- 358 I. (10s.) and 359 II. (5s.)—W. P. MEADOWS, Syston, Leicester.

Class 283.—Twelve Sections of Comb Honey. [21 entries.]

- 375 I. (£1.)—W. WOODLEY, Worlds End, Newbury.
 369 II. (10s.)—WAKEFIELD CHRISTIE-MILLER, Broomfield, Chelmsford.
 363 III. (5s.)—REV. F. T. SCOTT, Hartlip, Sittingbourne.

Class 284.—Six Sections of Comb Honey. [19 entries.]

- 398 I. (£1.)—W. WOODLEY, Worlds End, Newbury.
 399 II. (10s.)—J. GARRATT, Meopham, Kent.
 392 III. (5s.)—W. G. PRENOR, JUN., Shrewsbury.

Class 285.—Section of Comb Honey. [17 entries.]

- 416 I. (15s.)—J. GARRATT, Meopham, Kent.
 407 II. (10s.)—MISS M. L. GAYTON, Much Hadham, Herts.
 402 III. (5s.)—CAPT. W. ST. G. ORD, Fornham House, Bury St. Edmunds.

Class 286.—Exhibit of Run or Extracted Honey, in jars not exceeding 2 lb. each. [20 entries.]

- 436 I. (£1. 10s.)—J. GARRATT, Meopham, Kent.
 431 II. (£1.)—JAS. THORNE, Ashwell, Herts.
 428 III. (10s.)—MRS. H. J. COX, Fyfield, Abingdon.
 435 IV. (5s.)—M. WHITTLE, 5, Lockinge, Wantage.

Class 287.—Exhibit of Granulated Honey in jars, not exceeding 2 lb. each. [8 entries.]

- 443 I. (£1.)—W. STURDY, Thornton, Stony Stratford.
 437 II. (10s.) and 438 III. (5s.)—REV. J. KEMPE, St. Vengan, Grampond Rd.

¹ First Prize not awarded.

Class 288.—*Best and most attractive Display of Honey, in any form.*
[2 entries.]

446 II.¹ (£2.)—JAMES THORNE, Ashwell, Herts.

Class 289.—*Useful Inventions introduced since 1888.* [6 entries.]

447 Com.—THOS. LOWTH, Riseholme, Lincoln, for Unique Extractor, specially adapted for extracting from 1 and 2 lb. sections of loose combs.

Class 290.—*Most interesting and instructive Exhibit of any kind connected with Bee-culture not mentioned in foregoing Classes.*
[4 entries.]

453 I. (£1.)—REV. J. KEMPE, St. Vergan Vicarage, Grampound Road. Bees' Wax, various colours.

454 III.² (5s.)—HENRY J. ORCHARD, Helmingham, Stoneham, Suffolk. Diagrams for teaching bee-keeping in rural schools.

IMPLEMENTS.

Class 1.—*Light Portable Motors (steam or other) up to Five-Brake Horse-Power.* [6 entries.]

(a) MOTORS USING SOLID FUEL.

3492 I. (£30.)—SIMPSON, STRICKLAND, & CO., Dartmouth.

3496 II. (£20.)—E. R. & F. TURNER, Ipswich.

(b) MOTORS USING LIQUID OR GASEOUS FUEL.

3513 I. (£30.)—PRIESTMAN BROTHERS, LIM., Holderness Foundry, Hull.

[No Second Prize awarded.]

Class 2.—*Grist Mills, for use on a Farm, to be worked by an Engine not exceeding Ten-Brake Horse-Power.* [26 entries.]

3460 I. (£20.)—SAMUEL CORBETT & SON, Wellington, Salop.

3441 II. (£10.)—WOODROFFE & CO., Albion Iron Works, Rugeley.

Class 3.—*Disintegrators, suitable for working with a Portable or Traction Engine not exceeding Twenty-Brake Horse-Power.*
[8 entries.]

539 I. (£20.)—HARDY PATENT PICK CO., LIM., Heeley, Sheffield.

331 II. (£10.)—W. N. NICHOLSON & SONS, Trent Iron Works, Newark.

Class 4.—*Plant for Cider-Making, suitable for use on a Farm.*
[Trials deferred until the autumn.]

Silver Medals.

Awarded by the Council on the recommendation of the Judges of Miscellaneous Implements, for articles entered as "New Implements for Agricultural or Estate Purposes."

381 THOMAS BRADFORD & CO., Salford, Manchester: for Butter Worker, Patent "Arch Albany," with spiral roller and arched table.

¹ First and Third Prizes not awarded.

² Second Prize not awarded.

710 DAIRY SUPPLY CO., LIM., Museum Street, London, W.C.: for the application of a Refrigerator between the Separator and Churn in an Instantaneous Butter Maker.

2539 THE HARDY PATENT PICK CO., LIM., Sheffield: for Disintegrator,
8333 W. N. NICHOLSON & SONS, Newark: for Horse Rake "Snapdragon."

DAIRY APPLIANCES.

Class 5.—*Strong Dairy Thermometer.* [8 entries.]

905 (£1).—POND & SON, Blandford, Dorset.

Class 6.—*Collection of Non-returnable Parcel-Post Boxes, to carry from 1 lb. to 5 lb. of Butter.* [3 entries.]

4142 I. (£2).—HUGH STEVENSON, 31, Bridge Street, Ardwick, Manchester.
[Second Prize not awarded.]

Class 7.—*Collection of Non-returnable Parcel-Post Boxes, to carry from 5 lb. to 10 lb. of Butter.* [3 entries.]

4143 I. (£2).—HUGH STEVENSON, 31, Bridge Street, Ardwick, Manchester.
[Second Prize not awarded.]

Class 8.—*Vessel to contain Preserved Butter, closed hermetically, without the use of Solder.* [2 entries. No Award.]

Class 9.—*Sieve or Strainer, for use in Dairy.* [5 entries. No Award.]

BUTTER-MAKING COMPETITION.

Class 1.—*Dairymaids who have won a Prize at any Agricultural or Dairy Show.* [8 entries.]

7 I. (£6).—MISS ADA WILLIAMS, Chew Stoke, near Bristol.

5 II. (£4).—MRS. CARRIE L. HORTON, Little Leigh, Cheshire.

8 III. (£3).—MRS. M. J. WILLIAMS, Winford, Somerset.

3 IV. (£2).—MISS MARTHA BROWN, Failand, Somerset.

4 V. (£1).—MRS. J. BURSTON, Bridgwater, Somerset

Class 2.—*Dairymaids who have not before won a Prize at any Agricultural or Dairy Show.* [9 entries.]

13 } I. (£5 each).—MISS E. FARRANT, Exeter, & MISS ADA PERKINS, Holm-
17 } wood, Surrey.

11 III. (£3).—MISS J. COAD, Callington, Cornwall.

[Fourth and Fifth Prizes not awarded.]

HORSE-SHOEING COMPETITION.

LIMITED TO SHOEING-SMITHS IN THE COUNTIES OF BERKS, CORNWALL, DEVON, DORSET, HANTS, KENT, SOMERSET, SURREY, SUSSEX, AND WILTS.

Class 1.—*Hunters.* [22 entries.]

- 3 I. (£10.)—SAMUEL BATTEN, Furnham, Chard, Somerset.
- 1 II. (£5.)—JOHN HENRY BAKER, Sherwill Cross, Barnstaple.
- 13 III. (£3.)—WILLIAM HILL, Chagford, Newton Abbot, Devon.
- 10 IV. (£2.)—EDWARD DUNSTAN, 5 Berkeley Vale, Falmouth.
- 22 V. (£1.)—EDWARD WIGGINS, Wimbledon, Surrey.
- 7 H. C.—WILLIAM DENNER, JUN., Pound Square, Collumpton, Devon.
- 8 H. C.—WILLIAM DENNER, SEN., Pound Square, Collumpton, Devon.
- 4 H. C.—CHARLES LODGE, 1, Shapter Street, Topsham, Devon.

Class 2.—*Agricultural Horses.* [7 entries.]

- 29 I. (£10.)—WALTER WINSLADE, North Petherton, Somerset.
- 28 II. (£5.)—WILLIAM STREATHFIELD, Wimbledon, Surrey.
- 23 III. (£3.)—CHARLES COWELL, 19, Well Street, Plymouth.
- 27 IV. (£2.)—JOHN STAPLETON, 6, Regent Street, Plymouth.
- 26 V. (£1.)—JAMES GANE, Curry Rival, near Taunton.

FARM PRIZE COMPETITION.²

Class 1.—*For the best managed Arable and Grass Farm of 200 acres and upwards, not less than one-half being Arable.* [5 entries.]

- 5 I. (£60.)—W. P. VOSPER, Merafield, Plympton, Plymouth.
- 2 II. (£40.)—J. N. FRANKLIN, The Bussels, Huxham, Exeter.
- 3 III. (£20.)—[Special] MRS. HILL and her SON, Newtake, Staverton, Totnes.
- 1 Com.—JOHN STRANGER FORD, SEN., Hall Torrs, Yealmlpton, Plymouth.
- 4 Com.—WILLIAM LAWRY, Trevor Gorran, St. Austell, Cornwall.

Class 2.—*For the best managed Arable and Grass Farm above 100 and not exceeding 200 acres, not less than one-half being Arable.* [9 entries.]

- 7 I. (£60.)—EDWARD CORNISH, East Farm, Charleton, Kingsbridge.
- 9 II. (£40.)—JOHN S. FORD, JUN., Luson Holbeton, Ivybridge, Plymouth.
- 12 H. C.—CHARLES HORN, Blowiscombe, Yelverton, Tavistock.
- 13 Com.—HENRY QUARTLY, Molland, South Molton.

Class 3.—*For the best managed Arable and Grass Farm above 40 and not exceeding 100 acres.* [3 entries.]

- 17 I. (£50.)—JAMES W. LAWRY, St. Mellion, Saltash.
- 15 II. (£30.)—CHARLES BATH, Gear Farm, Camborne.
- 16 III. (£20.)—EDM. F. DAMBRELL, Colwell Farm, Egg Buckland, Crown Hill, Plymouth.

¹ Given by the Worshipful Company of Farriers, in addition to the FREEDOM OF THEIR GUILD.

² Prizes given by the Plymouth Local Committee.

³ Awarded for excellence of management in general, and in particular for treatment and production of cider, this being a branch of Devonshire farming which, in the opinion of the Judges, might be more profitably developed, especially if treated in the method followed by these competitors.

GRATUITIES TO FARM SERVANTS.

The Council have awarded certificates of distinguished merit in the discharge of their duties, together with a gratuity of one sovereign in each case, to the following servants on the competing farms.

Recommended by Mr. W. P. Vosper :—

GEORGE MADDOCK, for 19 years' service as general foreman, specially mentioned as very skillful at all kinds of work, and as having great confidence placed in him; and ANN MADDOCK, his wife, now in charge of the dairy at Saltram, specially mentioned for 30 years' service, and as being an industrious, reliable woman.

JAMES AVERY, for 24 years' service, specially mentioned as a first-class ploughman, and as being very trustworthy; and ELIZABETH AVERY, his wife, now in charge of the dairy at Merafield, for 21 years' service.

HENRY GABRIEL, in charge of the cows at Merafield, for 29 years' service, specially mentioned as a most attentive and valuable stockman, always on duty by 4 A.M.

WILLIAM HEMPHILL, for 20 years in charge of the cows at Saltram, specially mentioned as a valuable and trustworthy servant.

JOHN ELLIS, for 19 years' service as shepherd; and ELIZA ELLIS, his wife, in charge of the poultry at Bickham, specially mentioned as most attentive and successful in rearing all kinds of poultry, &c.

JOHN DUCKHAM, for 19 years' service as his employer's principal salesman of green forage in Plymouth.

Recommended by Mr. W. Lavery :—

WILLIAM YOULTON, for 25 years' service, specially mentioned as a very good, steady, and handy man.

STEPHEN SEAR, for 22 years' service, specially mentioned as a good ploughman, driller, &c.

Recommended by Mr. J. S. Ford, Senior :—

SAMUEL FREEMAN, for 35 years' service as shepherd, specially mentioned as having won 15 prizes for shearing and 16 for thatching.

SAMUEL HURRELL, for 27 years' service, specially mentioned as a very good workman, and as having won several prizes for "making" hedges.

Recommended by Mr. J. N. Franklin :—

THOMAS COWLEY, for 55 years' service as shepherd, &c., specially mentioned as very conscientious in the discharge of his duties, and as a first-rate man for all descriptions of stock.

JAMES GRANT, for nearly 27 years' service, and as foreman of the labourers during the last 21 years. Takes all the taskwork, such as hoeing, harvesting, cleaning water-carriers, &c., and is responsible for its proper performance. Specially mentioned as always willing to forward the work of the farm, and as a very valuable servant.

JOHN GRANT (brother of the preceding), for 19 years' service. Takes the entire management of the cider department, under Mr. Franklin's supervision, and is specially mentioned as being very reliable and industrious.

clxxxii *Award of Live-Stock Prizes at Plymouth.*

PRIZES OFFERED BY PLYMOUTH LOCAL COMMITTEE.
STOCK AND PRODUCE, £481; FARMS, £300.

Class	HORSES.	Prizes			
		1st	2nd	3rd	
Hunters.					
4	Mare or gelding, foaled in the year 1884 or 1885 :— (a) Light weight, up to 12 stone (b) Weight carrier, up to 15 stone	£ 20 20	£ 10 10	£ 5 5	
5	Mare or gelding foaled in 1886	20	10	5	
Hackneys.					
15	Mare or gelding foaled in either 1884 or 1885, not less than 14 hands and not exceeding 15 hands	15	10	—	
16	Mare or gelding, above 15 hands	15	10	—	
Ponies.					
19	Mare or gelding above 12 hands 2 inches and not exceeding 14 hands	15	8	3	
20	Mare or gelding, not exceeding 12 hands 2 inches	10	6	3	
	Champion Prize for the best pony (classes 19, 20, 23 and 26) suitable for riding purposes	20	—	—	
Agricultural Horses.					
43	Stallion, foaled previously to 1888	15	10	—	
47	Mare or gelding, foaled in or after the year 1884	15	10	—	
48	Pair of draught horses (mare or gelding), suitable for agricultural purposes in Devon and Cornwall	15	10	—	
CATTLE.					
Kerry.					
55	Bull, calved in 1884, 1885, 1886, 1887, 1888, or 1889	15	10	—	
96	Cow or heifer, calved previously to or in 1887	15	10	—	
97	Heifer, calved in 1888 or 1889	10	5	—	
Dexter Kerry.					
98	Bull, calved in 1884, 1885, 1886, 1887, 1888, or 1889	15	10	—	
99	Cow or heifer, calved previously to or in 1887	15	10	—	
100	Heifer, calved in 1888 or 1889	10	5	—	
Wool. (3 fleeces in each class.)					
Class	252. Devon long wool	£4	Class	254. Dartmoor	£4
253.	South Devon	£4	255.	Exmoor	£4

Butter.

Class 264. Three pounds, made from scalded cream : five of £5 each, five of £3 each.

PRIZES OFFERED BY DEVON COUNTY AGRICULTURAL ASSOCIATION.
(£302.)

PONIES. (Not exceeding 13 hands 2 inches.)

Dartmoor.				
21	Stallion, foaled before January 1, 1888	8	4	—
22	Mare in foal, or with foal at foot	8	4	—
23	Mare or gelding (to be ridden)	6	4	—
Exmoor.				
24	Stallion, foaled before January 1, 1888	8	4	—
25	Mare in foal, or with foal at foot	8	4	—
26	Mare or gelding (to be ridden)	6	4	—
CATTLE.				
South Devon (Hams).				
67	Bull, calved in 1884, 1885, 1886, or 1887	15	10	5
68	Bull, calved in 1888	15	10	5
69	Bull, calved in 1889	10	5	3
70	Cow or heifer, in-milk or in-calf, calved previously to or in 1887	15	10	5
71	Heifer, calved in 1888	10	5	3
72	Heifer, calved in 1889	10	5	3
SHEEP.				
South Devon.				
140	Two-shear ram	15	10	5
141	Shearing ram	10	10	5
142	Pen of three shearing ewes, of the same flock	15	10	5

CHAMPION PRIZES.

Champion and other Prizes offered by various Societies through the Royal Agricultural Society of England, at the Plymouth Meeting.

HORSES.

HACKNEY HORSE SOCIETY:
Class 12—Hackney stallion, foaled in 1888:
1st, £15; 2nd, £10.

SHIRE HORSE SOCIETY:
Best Shire stallion, £25.
Best Shire mare or filly, £15.

CLYDESDALE HORSE SOCIETY:
Best Clydesdale horse and mare or filly,
£25 each.

SUFFOLK STUD-BOOK ASSOCIATION:
Class 41—Suffolk stallion, foaled in 1889,
1st, £15; 2nd, £10.
Class 45—Suffolk filly, foaled in 1889,
1st, £15; 2nd, £10.

CATTLE.

SHORTHORN SOCIETY:
Best Shorthorn male and female, £25 each.

SHEEP.

SOUTHDOWN BREEDERS:
Best Southdown ram, Cup, value £25.

PIGS.

BRITISH BERKSHIRE SOCIETY:
Best Berkshire boar, farrowed 1889, and
breeding sow, farrowed previously to or
in 1889, Cups, value £10 each.

Horse-shoeing Competition.

THE WORSHIPFUL COMPANY OF FARRIERS:
The two first Prizes in both Classes, value
£10 each, together with the Freedom of the
Guild.

INSTRUCTIONS TO THE JUDGES.

The following were the Instructions to the Judges contained in the Prize-Sheet:—

1. As the object of the Society in giving Prizes for Cattle, Sheep, and Pigs, is to promote improvement in BREEDING Stock, the Judges, in making their awards, are not to take into consideration the present value to the butcher of animals exhibited, but to decide according to their relative merits for the purpose of BREEDING.
2. In the Classes for Stallions, Mares, and Fillies, the Judges, in awarding the Prizes, will, in addition to symmetry, take activity and strength into consideration, and pay special attention to freedom from hereditary disease.
3. In the Classes for Poultry, high condition, quality, purity of race, and weight will be taken into consideration by the Judges in a greater degree than mere beauty of plumage without these distinctions. If the Judges are perfectly satisfied that in any case the age has been incorrectly stated, they are empowered, with the sanction of the Stewards, to disqualify such entries; and no appeals from the decision of the Judges will be entertained upon any grounds whatever.
4. If, in the opinion of the Judges, there should be equality of merit, they will make a special report to the Stewards.
5. The Judges, with the sanction of the Stewards, will withhold Prizes from any animals entered in a wrong Class.
6. The Judges will withhold any Prize if they are of opinion that sufficient merit in the Stock or Produce exhibited for each Prize does not exist to justify an award.
7. The Judges will give in a "Reserve Number" in each Class indicating the animal or exhibit which in their opinion possesses sufficient merit for the Prize, if the animal or exhibit to which the Prize is awarded should become disqualified.
8. The Judges will deliver to the Stewards their awards, signed, stating the numbers to which the Prizes are adjudged, before they leave the Yard, and noting all disqualifications. Immediately after the Show they are to transmit, under cover to the Secretary, their reports on the several classes in which they have adjudicated, in order that the substance of such report may be included in the General Report of the Exhibition at Plymouth, to be published in the Journal of the Society.

MEMORANDA.

ADDRESS OF LETTERS.—All letters on the general business of the Society should be addressed to the Secretary, at 12 Hanover Square, London, W.

TELEGRAMS.—The Society's registered address for telegrams is "Practice, London." *Replies by Telegraph cannot be sent unless paid for in advance, and cannot be guaranteed in any case.*

TELEPHONE NUMBER, 3675.

OFFICE HOURS.—10 to 4. On Saturdays 10 to 2.

COUNTRY MEETING at Doncaster, Monday, June 22, to Friday, June 26, 1891 (both inclusive).

GENERAL MEETING in London, Thursday, December 11, 1890, at noon, in the large hall of the Royal Medical and Chirurgical Society, 20 Hanover Square, W.

MONTHLY COUNCIL (for transaction of business), at noon on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

ADJOURNMENTS.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

SUBSCRIPTIONS.—1. *Annual.*—The subscription of a Governor is £5, and that of a Member £1, due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June.

2. *For Life.*—Governors may compound for their subscriptions for future years by paying on election, or at any time thereafter, the sum of £50, and Members by paying £15. Members elected before 1890 may compound at any time on payment of £15 in the sum; and Members elected in or subsequently to 1890 may compound for the same amount after the payment of ten annual subscriptions. Governors and Members who have paid their annual subscription for 20 years or upwards, and whose payments are not in arrear, may compound for future annual subscriptions, that of the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member. No Governor or Member can be allowed to enter into composition for life until all subscriptions due by him at the time shall have been paid.

No Governor or Member in arrear of his subscription is entitled to any of the privileges of the Society.

All Members belonging to the Society are, under the Bye-laws, bound to pay their annual subscriptions, until they shall withdraw from it by notice in writing to the Secretary.

PAYMENTS.—Subscriptions may be paid to the Secretary, either at the office of the Society, No. 12 Hanover Square, London, W., or by means of crossed cheques in favour of the Secretary, or by postal orders, to be obtained at any of the principal post-offices throughout the kingdom, and made payable at the Vere Street Office, London, W. When making remittances it should be stated by whom, and on whose account, they are sent. All Cheques and Postal Orders should be crossed "London and Westminster Bank, St. James's Square Branch."

On application to the Secretary, forms may be obtained for authorising the regular payment, by the bankers of individual members, of each annual subscription as it falls due. Members are particularly invited to avail themselves of these Bankers' orders, in order to save trouble both to themselves and to the Society. When payment is made to the London and Westminster Bank, as the Bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the bankers' book may be at once identified, and the amount posted to the credit of the proper person. No coin can be remitted by post, unless the letter be registered.

JOURNAL.—The Parts of the Society's Journal are (when the subscription is not in arrear) forwarded by post to Members or delivered from the Society's Office to Members or to the bearer of their written order.

The back numbers of the Journal are kept constantly on sale by the publisher, Mr. JOHN MURRAY, 50a Albemarle Street, W.

NEW MEMBERS.—Every candidate for admission into the Society must be nominated by a Governor or Member, and must duly fill up and sign an application for Membership on the appointed form. Forms of Proposal may be obtained on application to the Secretary. The Secretary will inform new Members of their election by letter.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, NOVEMBER 5, 1890.

THE EARL OF RAVENSWORTH (PRESIDENT) IN THE CHAIR.

Present:—

Trustees.—Earl Cathcart, Mr. J. D. Dent, Col. Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart.

Vice-Presidents.—Earl of Feversham, Lord Moreton, Sir John Thorold, Bart., Mr. C. Whitehead.

Other Members of Council.—Mr. G. M. Allender, Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. Joseph Beach, Mr. J. Bowen-Jones, Mr. J. A. Caird, Mr. H. Chandos-Pole-Gell, Mr. Charles Clay, Earl of Coventry, Mr. Percy E. Crutchley, Mr. Alfred Darby, Mr. William Frankish, Mr. R. Neville Grenville, Mr. James Hornsby, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. T. H. Miller, Hon. Cecil T. Parker, Mr. Albert Pell, Mr. Daniel Pidgeon, Mr. G. H. Sanday, Mr. Alfred J. Smith, Mr. Henry Smith, Marquis of Stafford, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. Joseph P. Terry, Mr. John Tremayne, Mr. R. A. Warren, Mr. H. V. V. Wheeler, Mr. C. W. Wilson, Sir Jacob Wilson.

Professor Brown, C.B.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Mr. E. W. Voelcker, Acting Consulting Chemist; Mr. Wilson Bennison, Surveyor.

The following representatives of the Doncaster Local Committee were also present: The Mayor of Doncaster, Mr. F. Bacon Frank, Mr. G. T. Wood, Mr. G. B. C. Yarborough, and Mr. George Chafer (Secretary).

Election of New Members.

The minutes of the last monthly meeting of the Council, held on July 30, having been read and confirmed, the election of the following 54 Members was proceeded with:—

ALABASTER, C. C...Searchfield, Breamore, Wilts.
ANDERSON, W. H...Holbeache, near Bewdley.
BAILEY, HILBERTON...Bling, Southampton.
BEACH, Capt. A. W. HICKS...Wick House, Downton, Wilts.
BEATON, A. C. H...6 Netherhall Gardens, Hampstead.
BERESFORD-HOFFE, P. B...Bedgebury Park, Hawkhurst.
BROCKLEHURST, Major...Ranksboro', Oakham.
BROWNLOW, Gen. Sir C. K.C.B...Warfield Hall, Berks.
BUCKWELL, J. C...Boyces, Ewhurst, Sussex.
BULLER, C. W...Donaghadee, Ireland.
CALDWELL, C. H. B...Windlesham, Surrey.
CARTER, F. W...East Hoathly, Sussex.
CASTLE, A. S...Charlton, Wantage.
COOKSON, H. T...Sturford Mead, Warminster.
COUSINS, D. C...131 High Street, Oxford.
DAVIS, T. H. N...Orleton, near Tenbury.
DUPUIS, F. J...Sessay Rectory, Thirsk.
EAGLES, J. G...Leamington Spa, Warwick.
GAMMILL, S. J...Drumtochty Castle, Fording, N.B.
GLYN, A. P...Arlow Banks, Whorlton, Darlington.
HARRIOTT, W...Raynes Park, Wimbledon.
HARVEY, Mrs...The Cliff, Shanklin, I. W.
HAWES, E. A...Abbot's Mead, Elstree, Herts.
HENDERSON, A...Buscot Park, Faringdon.
HORNSBY, R...Hovingham, York.
HUBBARD, W. B...Selehurst, Horsham.
JONES, T. M...Northam, Devon.
KIRKHAM, W...Bangley Farm, Fazeley, Tamworth.
KNIGHT, Rev. J. G. B...Middleham Rectory, Yorks.
LATHAM, E. B...Blacktoft, Howden.
LEATHAM, A. E...Misarden Park, Cirencester.
LOYD-VERNNEY, J. H...Clochfaen, Llanguig, Mont.
MACAN, R. E...Elstow Lodge, Bedford.

MILLER, N. H. J., Ph.D... Rothamsted, Herts.
 *NEWMAN, H... Bishopstrow Farm, Warminster.
 OLIVER, T. B... Greenoak Hall, Brough, Yorks.
 *FARRINSON, J... The Chalets, St. John's, Worcester.
 POLLEY, O. J... Kelvedon, Essex.
 POTTER, R... Sawrey Knotts, Windermere.
 POWYS, Rev. C. R... Rofford, Wallingford.
 PURVES, PETER... Huntingdon.
 ROBERTS, G. C. E... Dock House, Billiter Street, E.C.
 SEYMOUR, R. S... Ashburnham Villa, Burry Port, Carmarthen.
 SOMERTON, Lord... Woodjates, Cranborne, Dorset.
 SPIER, Capt. J. E. P... Spye Park, Chippenham.
 STANDIDGE, PERCY... Fryton, Slingsby, Yorks.
 THOMAS, OWEN... Llanerchymedd, Anglesey.
 THOMAS, R... Boveton Place, Cowbridge, Glam.
 TYLER, J... Crown Farm, Gedney Marsh, Long Sutton.
 WHITTAKER, W... Thrybergh, Rotherham.
 WHITTELL, W... Kirkburton, Huddersfield.
 WILLIAMS, C. S... Ivy House, Edenbridge.
 WYNNE, Major... Mellaston, Pembroke.
 ZACHARIAS, J... Oxford.

The reports of the various Standing Committees were then presented and adopted as below:—

Finance.

SIR NIGEL KINGSCOTE (Chairman) reported that the Committee had held a special meeting on the preceding day in order to deal with a number of arrears of subscriptions of members, and they recommended that a letter be written to each of the members owing 2*l.* and upwards, drawing attention to his agreement with the Society, and requesting prompt payment. A list had been submitted of 251 life members who had not yet sent a receipt for the Journal, and the Secretary had been instructed to send a registered letter to each of these members, drawing his attention to the provisions of By-law 5. The Committee recommended that the names of four foundation life governors, eighteen life and twenty-one annual members, deceased, seven members resigned, two whose addresses could not be found, and twenty-nine who were in arrears, be struck off the register; also that the names of two members be restored to the list under By-law 12. At the ordinary meeting held that morning the accounts for the period ended October 31, as certified by the Society's accountants, had been laid upon the table and approved. The

total receipts for this period were 11,372*l.* 9*s.* 2*d.*, and the expenditure was 12,804*l.* 18*s.* 7*d.* The balance at the bankers on October 31, allowing for cheques outstanding, was 2,558*l.* 7*s.* Accounts amounting in all to 2,317*l.* 11*s.* 1*d.* had been passed, and were recommended for payment. The quarterly statement of property and arrears had been laid upon the table.

Deaths of Foundation Life Governors.

SIR NIGEL KINGSCOTE said the Council would observe with regret from the Finance Committee's report that four of the original subscribers to the Society (Mr. W. Aldam, of Frickley Hall, Doncaster; Mr. F. H. Dickinson, of King's Weston, Somerset; Mr. Joseph Druce, of Eynsham, Oxford, a Member of the Council from 1860 to 1888; and Mr. Isaac P. Evans, of Griff, Nuneaton) had died in the interval which had elapsed since their last meeting.

Premiums to Thoroughbred Stallions.

SIR NIGEL KINGSCOTE said that he must ask permission to bring before the Council at this stage a matter which had been strongly pressed upon his personal attention by some very influential members of the Royal Commission on Horse Breeding, viz., the continuance by the Society of the three premiums for thoroughbred stallions which they had heretofore given for the district in which their show was held. The Council decided this time last year, after full debate, that they would give the premiums for the present season, but it was at the same time generally understood that a continuance of the grant was not contemplated by the Society. No formal letter on the subject was addressed to the Royal Commission on Horse Breeding, but the feeling of the Council was expressed in the words used by the Commissioners in their third report to Her Majesty, dated May 5, 1890, that "the Royal Agricultural Society consider the time has now arrived when all the districts in the country should be provided for out of the funds of the Commission." The Commissioners based on this and on the evidence

* Re-instated under By-law 12.

taken before them an application to the Treasury for an increase of their grant, so as to provide for an extension of their general operations and for the premiums in the district heretofore undertaken by the Society. The application of the Commissioners to the Treasury had not up to the present been successful, though it was understood that the subject was still "under consideration." Meanwhile it was important that the arrangements for the selection of stallions for the season of 1891 should be settled, and publicly announced without delay; and in view of the fact that the Royal Commissioners, with the funds at present at their disposal, could not, without dislocation of their arrangements, provide for the service of the thoroughbred stallions throughout the country on the plan which had been adopted for the last three years, pressure had been brought upon him to recommend the Council to continue its grant for another year. The Finance Committee had last year left it to the Council to decide the matter, and they must do the same this year. At the same time, if the Council thought the expenditure a proper one to incur, the Committee would not interpose any financial objection. For himself, speaking not as Chairman of the Finance Committee, but in his private capacity as a member of the Council, he should be glad if the arrangement could be carried out.

Mr. DENT said that if such a grant were desired from the Society, due notice ought to be given to members of the Council in the usual way.

Sir JACOB WILSON explained the reasons for urgency in the matter, and detailed the negotiations which were going on for an increase in the Government grant to the Commission.

The Earl of COVENTRY hoped the Council would see their way to continue the grant. All those interested in the breeding of horses had reason to be deeply grateful to the Society for the action which it had taken towards placing the services of sound thoroughbred sires within the reach of tenant-farmers at reasonable rates. In order to enable the Council to come to a conclusion on the matter at

that meeting, he begged to move the suspension of the Standing Orders with regard to notices of motion for grants of money.

Earl CATHCART seconded this motion, which was carried.

The Earl of COVENTRY then moved, and the Earl of FEVERSHAM seconded:—

That a grant of 600*l.* be made out of the funds of the Society for the purpose of providing three premiums of 200*l.* each to thoroughbred stallions for the forthcoming year in District E (Yorkshire), in which the annual show of the Society will be held in 1891, subject to the understanding that all other expenses connected with such stallions are borne by the Royal Commission on Horse Breeding.

In the course of the discussion on this motion, in which Sir NIGEL KINGSCOTE, the PRESIDENT, the Earl of FEVERSHAM, Sir JACOB WILSON, Mr. DENT, Mr. MARTIN, and other members took part,

Sir JACOB WILSON said he thought he might venture to say, on behalf of the Royal Commission, that if the Society would provide the premiums, the Commission would undertake all the expenses of judging, printing, and other incidentals.

Eventually Lord COVENTRY'S motion was put to the vote, and carried by thirty-one votes to two.

The PRESIDENT said that he was sure he expressed the feeling of the Council when he hoped that if the Society subscribed—and handsomely subscribed—to the fund for providing sound stallions, farmers would meet them by sending sound mares to such stallions. That was a question of large dimensions, and he hoped it would be discussed at greater length when they had more time. It was of very little use to provide these stallions unless the mares farmers sent to them were sound, well-bred animals.

Subsequently, Mr. BACON FRANK, on behalf of the Local Committee, said that in order to continue the gold medals which had in past years been given to the stallions winning the Society's premiums, the Don-

caster Committee would be happy to provide funds for the award of the Gold Medal to each of the three stallions which won the Society's premiums in the forthcoming year.

The PRESIDENT expressed the thanks of the Council to the Local Committee for their action in this matter.

House.

Sir NIGEL KINGSCOTE presented the report of this Committee, which dealt with various repairs and articles required for the house.

Journal.

Earl CATHCART (Chairman) reported that the third number of the new series of the Journal was published on September 30, and issued immediately to members. He presented the recommendations of the Committee as to the payment for literary contributions to, and for the printing of, that number. Eleven entries had been received for the farm competition in connection with the Doncaster Meeting, and the Committee recommended that on this occasion two judges only be appointed. A paper which had been forwarded by Mr. Nott, on Foot-rot in Sheep, had been further considered, and it had been decided that the substance of it should be published in the Journal. The proposed arrangements for the next number had been considered and approved.

Chemical.

Mr. WARREN (in the absence of Viscount EMLYN, Chairman) presented the report of this Committee, and stated that letters from Mr. James Snowsell, with reference to the last quarterly report of the Chemical Committee, had been considered, and it had been decided that no further steps should be taken in the matter. Various other matters connected with the Chemical Department and the Woburn Experimental Farm had been discussed.

The SECRETARY read a letter from Dr. J. Augustus Voelcker, the Society's Consulting Chemist, thanking the Council for the extension of his leave of absence in India.

Seeds and Plant Diseases.

Mr. WHITEHEAD (Chairman) reported that Mr. Carruthers' inquiry into his examination of pastures had been completed, and the Committee recommended that this report be published in the next number of the Journal. [See p. 751.] Miss Ormerod had presented a report, which the Committee also recommended for publication. [See p. 837.]

Veterinary.

Sir JOHN THOROLD (Chairman) reported that, in obedience to the instructions given by the Council at their last meeting, circular letters had been addressed to all the members of the Society asking their co-operation in carrying out the provisions of the Pleuro-pneumonia Act, and also to the Society's provincial veterinary surgeons, requesting that immediate notice of any outbreak of the disease coming to their knowledge should be given by telegraph to the Society's offices. Particulars of every outbreak notified to the Society had been at once forwarded to the Board of Agriculture. The Committee had discussed the question of Foot-rot in sheep which arose at the last meeting of the Council. Professor Brown having stated that there was great difficulty in getting diseased animals, some of the members of the Committee had offered to obtain two or three sheep virulently affected with the disease, for the purpose of further experiment at the Royal Veterinary College.

The Committee recommended that prizes be offered for a horse-shoeing competition at Doncaster, in two classes (Hunters and Agricultural Horses), limited to the county of York.

Mr. Vessey, the Society's provincial veterinary surgeon for Dorset, having removed from that county, the Committee recommended that Mr. C. Hedworth Gollidge, of Sherborne, be appointed to the vacancy. Professor Brown's pamphlet on "Dentition" being out of print, the Committee recommended that a new edition be prepared, with any revision which the Professor might think necessary.

Professor Brown had presented the following report:—

PLEURO-PNEUMONIA; — Between

the 1st September, when the Pleuro-pneumonia Act of 1890 came into force, and the 1st November, a period of nine weeks, eighty fresh outbreaks of this disease have occurred in Great Britain. The counties in which these took place were—Chester, Derby, Essex, Hunts, Lancaster, London, Middlesex, Norfolk, Salop, Stafford, Surrey, York (North and West Ridings), in England; and Aberdeen, Edinburgh, Fife, and Forfar, in Scotland. In addition to the cattle slaughtered in the above counties, a number which had been exposed to the risk of infection were slaughtered in the counties of Lincoln and Northampton.

The total number of cattle slaughtered by order of the Board of Agriculture since the Act came into operation has been about 3,250: this includes not only the diseased cattle and those in contact with them, but also some that were suspected, which it was deemed expedient to slaughter. In Ireland there have been twenty-eight outbreaks of pleuro-pneumonia since the beginning of September, two in the neighbourhood of Drogheda, the remainder in the Dublin district.

ANTHRAX.—During the thirteen weeks from the beginning of August to the 25th October, there have been twenty-eight fresh outbreaks of this disease in England, in the counties of Berks, Cornwall, Derby, Dorset, Kent, Lincoln, Norfolk, Northampton, Notts, Somerset, Stafford, Sussex (East), York (North Riding), and York (West Riding). The number of animals attacked was 177. Of these diseased animals one was killed, 119 died, and twenty-nine recovered. No case of anthrax was reported in either Wales or Scotland.

SWINE FEVER.—There were 1,525 fresh outbreaks of this disease reported in Great Britain during the thirteen weeks ended October 25th; 7,498 swine were attacked, 3,336 diseased pigs were killed, 3,264 died, 1,111 recovered, and 434 remained alive at the date when this return was made up.

Earl CATHCART was exceedingly

glad that the Veterinary Committee had taken up the subject of Foot-rot in sheep, with a view of ascertaining its contagious character. The Americans took a very serious view of that troublesome disease: it was one of their scheduled diseases. Only the other day Sir James Paget had made the observation that "the medical practitioner must be a student as long as he lives. He goes on or he goes back." That observation eminently applied to veterinary science.

Mr. PELL, in reference to pleuro-pneumonia, drew attention to a fact which they had lately ascertained in Northamptonshire, and which he considered ought to be made public. A number of beasts which had become affected with pleuro-pneumonia were known not to have been in contact with the disease since the 8th May last, showing that the disease had been latent in those animals for five months.

Stock Prizes.

Mr. SANDAY (Chairman) reported that the Committee had arranged a preliminary prize sheet for the Doncaster Meeting, which would be printed and sent out to each member of the Council before the December meeting, when the Committee would bring up a formal motion for its adoption. Professor Brown and Mr. Duguid had attended the Committee for the purpose of giving any necessary explanations as to the disqualification of pigs at Plymouth under the dentition test. After consideration of the general question, the Committee resolved unanimously that no alteration in the existing rules or practice should be made.

A letter was read from the Shire Horse Society offering Champion Gold Medals for the best Shire stallion and the best Shire mare or filly exhibited at Doncaster, and, on the motion of Mr. SANDAY, this offer was accepted with thanks.

Subsequently the SECRETARY read a telegram from the Earl of Powis with reference to prizes for Welsh cattle, and

Mr. MAINWARING gave notice that at the next meeting of the Council he

should, if necessary, move that classes for Welsh cattle be provided at Doncaster.

Implement.

Mr. FRANKISH (Chairman) reported that the trials of the cider-making plant entered for competition in connection with the Plymouth Meeting had been duly carried out at Glastonbury, on Wednesday, October 15.

The Committee recommended that trials of separators be held at Doncaster; also that prizes be offered for a mechanical milking machine. A return of the silver medals awarded by the Society for the last ten years had been laid upon the table, and the general question of the giving of silver medals discussed. The Committee did not recommend any departure from the existing principle with regard to these awards, but had amended the regulations so as to make it necessary, before a medal could be awarded, for a new invention to have been subjected to actual trial. The draft regulations for the exhibition (not for competition) of implements at the Doncaster Meeting had been considered, and with some modifications approved and settled. The Committee had further considered the question of the issue of a single combination catalogue of the Society's shows, and recommended the Council to incur the necessary increased expenditure in selling at one shilling a single catalogue containing particulars of all the exhibits—stock, implements, and produce—in the showyard.

General Doncaster.

Mr. DENT reported that 11 entries had been received for the Farm-Prize Competition, as follows:—

CLASS I. (5 entries.)

HUTCHINSON, TRANDALE H., Manor House, Oatfield.
 LODGE, JOSEPH.. Woodfield House, Robin Hood's Well, Doncaster.
 PARKIN, SMITH EYRE.. Melton Brand, Doncaster.
 STAVELEY, JOHN ALFRED.. Manor House, North Dalton, Hall.
 TOWNEND, JAMES.. Newton, Doncaster.

CLASS II. (2 entries.)

MERRYWEATHER, ANDREW.. Whiston, Rotherham.
 STANLEY, JOHN.. Campsall, Doncaster.

CLASS III. (4 entries.)

HINCHCLIFF, JOSEPH and WILLIAM.. Lady Oak Farm, Emley, Wakefield.
 KENT, SAMUEL.. Barmborough, Doncaster.
 STRICKLAND, TOM D.. Carlton Miniott, Thirsk
 WALSH, WILLIAM.. Gilstead, Bingley.

The suggestions made by the Stock Prizes Committee with reference to the Prizes proposed to be offered by the Local Committee had been discussed, and referred back to the Local Committee for further consideration. The Mayor of Doncaster had reported that the arrangements for regulating the Cab Fares, Local Police, &c., were in hand.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the whole of the Society's plant at Plymouth had been cleared away, and stored under cover on a piece of land provided for that purpose at Doncaster. The total cost on account of the various works in the showyard, after deducting the amounts realised by sale of materials and that received from exhibitors and purveyors (£3,929l. 8s. 9d.), was 5,092l. Four tenders for the supply of timber for the Doncaster Show had been received, and the Committee recommended that Messrs. Richard Wade, Sons and Co.'s tender be accepted.

Selection.

The recommendations of this Committee having been read, it was unanimously resolved, on the motion of Earl CATHCART, seconded by the Earl of COVENTRY, that the Honorary Membership of the Society be conferred upon the following gentlemen, in recognition of their distinguished services to agriculture:—

The Baron ARTHUR VON HOHENBRUCK, of the Imperial Ministry of Agriculture, Vienna.

Chevalier EMANUEL VON PROSKOWETZ, sen., of the Imperial and Royal Agricultural Society of Moravia and Silesia.

The diplomas as Honorary Members of these gentlemen were then signed by the President and the Secretary, and sealed with the Society's seal.

Vacancy on the Council.

The PRESIDENT said that during the autumn he had received from the Earl of Jersey a letter in which he expressed his sorrow at having temporarily to part from the Council, in order to take up a post under the Crown of great responsibility and importance. He (Lord Ravensworth) had ventured to reply—and he hoped that he had expressed the feelings of the Council in so doing—that the Society regretted extremely the loss of Lord Jersey's assistance, but were quite sure, after their long acquaintance with him, that he was the right man in the right place.

Education.

Mr. DENT (Chairman) reported that arrangements had been made for the Society's Junior Examinations, to be held on the 11th and 12th instant, and that forty-two candidates had been entered from fourteen schools. The ten successful candidates at last year's examination having duly complied with the regulations, the Committee recommended that the cheques for the scholarships be now paid to them.

Communications had been received from the Charity Commissioners forwarding copies of the West Lavington (Wilts) and Woodbridge (Suffolk) Foundation Schemes, as submitted to the Committee of Council on Education, and thanking the Council for the criticisms which they had offered in February last. The Commissioners had given effect to all the suggestions of the Council, with the exception of the one referring to the clauses which stipulated that the scholarships should be limited to boys residing within the neighbourhood of the school. The date of the next Senior Examination had been fixed for Tuesday, May 12, to Saturday, May 16, 1891.

The Committee had again given careful consideration to the six recommendations of the Joint Committee of the Central Chamber of Agriculture and the Farmers' Club on technical education in agriculture, which were referred back to them by the Council on June 4 last. A report on the subject [see p. 851] had been submitted

by him as Chairman, and had been passed in the Committee by his casting vote.

Technical Education in Agriculture.

Mr. DENT said he must detain the Council for a few moments, because one of the recommendations of the Education Committee yesterday was only carried by his own casting vote, and therefore it would be necessary for him to say a few words on the matter. The Council would recollect that they gave a somewhat hurried examination to the report of the Joint Committee of the Central Chamber of Agriculture and Farmers' Club, in the month of June last, and they then advised the concurrence of the Council in the recommendations of that Joint Committee. The Duke of Richmond, however, took strong objection to their concurring in the first recommendation, and also doubted the expediency of the last one; and the report was eventually referred back to their Committee. Since then much had happened. The Board of Agriculture had given attention to the subject. They had made several grants, and they had written to different educational bodies and to the Council, urging them to pay more attention to technical education in agriculture, and to formulate schemes for that purpose. In consequence of this, he had ventured to lay yesterday before the Committee a report which had been printed, and which was laid upon the table. That report alluded to what had taken place with regard to other educational bodies. Paragraph 3 of the report mentioned that the University of Cambridge and the Yorkshire College at Leeds had both taken up the subject; and both had done him the honour of asking him to serve upon the Syndicates which were to be appointed to consider the establishment of chairs of agriculture at each of those institutions—he presumed because of his position as Chairman of the Education Committee. The University College of North Wales had already at work an agricultural department, and agricultural sides were being established in several county schools. There was also a sum of money allocated to the County Councils, which he believed was avail-

able for technical education. Therefore, the first portion of that report, down to paragraph 9, he thought he might say gave a short sketch of all that had been done, and suggested what might be done further, and what assistance might be given from County funds, and also from Imperial funds. So far there was no difference of opinion in their Committee. They agreed to endorse the views of Nos. 2, 3, 4, and 5 of the recommendations adopted by the Joint Committee.

Then they came to a very important matter, viz., the first recommendation of the Joint Committee: That a Normal School or College of Agriculture should be established and maintained at the expense of the State somewhere in England. The more he considered that subject, the more he individually felt the difficulty at the present moment and the inexpediency of founding such a college equipped and managed by the State. No one had a great opinion of the State Institution at South Kensington in its work for the diffusion of agricultural knowledge; and under the supervision and management of Government officers they might have the same sort of thing. Moreover, if a farm were taken in hand, it would certainly be a losing concern. The Royal Agricultural College, Cirencester had been obliged to transfer the farm to practical hands. At Barnard Castle and Aspatria neighbouring farmers with diverse systems of management placed their farms at the disposal of the authorities of the schools, that they might take their pupils to the farms and show them what was being done. He could give other reasons, but he would not detain the Council. He had a very strong personal opinion that it was unwise to establish a State School of Agriculture, and therefore the recommendation of that report which he had laid before the Committee was that they should not concur in Recommendation 1 suggesting the establishment of a Central Normal School of Agriculture. This was agreed upon by their Committee yesterday.

They did not think either that it was advisable to go further than what was being done at present by recom-

mending that agricultural subjects should be taught in rural elementary schools. Generally speaking, the masters of these schools had already quite enough to do in teaching all the subjects now given to them. It would not be wise, and it would be hard upon the teachers, to put upon them the teaching of the additional subject of agriculture. The Committee suggested that the better-informed scholars might be granted bursaries or scholarships to go to the secondary schools for the study of agriculture. They might have better reading-books and diagrams for teaching agricultural subjects, but of course he could not now go into details with regard to those matters. The report in effect approved of Recommendations Nos. 2, 3, 4, and 5, and disagreed with the Recommendations Nos. 1 and 6. He begged to move that that report be received and adopted.

Mr. PELL, as the member of Council who moved the amendment in Committee, said it would not be out of place if he made a few remarks upon it, and the reasons which led him to differ from some of his colleagues. It had been stated by Mr. Dent that his motion had been lost only by the casting vote of the Chairman, but he would have submitted to that decision unhesitatingly had it not been that he felt that the question which had been raised was one of extreme importance to that Society: more, perhaps, to that Society than to the cause of agricultural education generally. The first resolution of the Joint Committee of the Central Chamber of Agriculture and the Farmers' Club—he was not upon that Committee—dealt with the scientific teaching, and that it would be best given in one Normal School for Great Britain. He concurred in that view, because he thought the science of agriculture—if there were such a thing—was extremely obscure, extremely difficult to master, somewhat novel, and, as far as his judgment went, there would be but few men in this country, and possibly in Europe, able to deal with the question. Consequently, he thought that they could hardly expect to find those geniuses scattered about in any sporadic

manner throughout the country. If they did, those geniuses would probably be very much impeded by bringing themselves in contact with the rural mind as it would be exhibited in county associations and county schools. Therefore he wanted to separate—and he hoped that the Council would join in that view—scientific teaching from what he would call systematic teaching. Scientific teaching must be the same all over the world; technical teaching must vary according to the district in which it was carried on, the nature of the soil, and the character of the people. Scientific teaching would be as true and good for the county of Middlesex as for the county of York. The University of Cambridge, of which he was a member, had turned its attention to the subject, and a Council was sitting at Cambridge now—in fact, had nearly finished its session—to form a syndicate for the teaching of agriculture in that University. They were more likely to do good in acting in harmony with such a great and old teaching-establishment as Cambridge than by asking the University to put themselves into association with a number of scientific establishments in different parts of the Kingdom.

He did not believe that any sound technical teaching in Great Britain could be acquired out of the shop—the shop in this instance being, of course, the farm. Neither did he believe that under the present circumstances of agriculture they should tempt young men to leave any department—even that of the Church or the study of the law—for anything which was now regarded so unprofitable and unremunerative as agriculture. There would no doubt be much talking and writing on the subject of technical agricultural education, and it might do some good. Still, the science of agriculture was a much more important thing. Even if he lived another fifty years he would not expect to see a very great development of agricultural science. On the other hand, they could not at once set agriculture aside and say that it could not be benefited by scientific research. He did, indeed,

doubt whether it could be benefited by any science that was provided by a provincial institution which promulgated its information as the teachings of science. Perhaps all he could ask for that day was that the judgment of the Council on this report should be suspended, at all events until they heard what the University of Cambridge was doing on this subject, and until he and others had had an opportunity of conferring with men whose opinion would be valuable. The first name he would suggest would be that of Lord Rayleigh, who was a distinguished (probably the most distinguished) member of the University to which he (Mr. Pell) belonged. Dr. Gilbert and Sir John Lawes, and perhaps some of the leading minds in the Cambridge University, with whom he was not acquainted, should also be consulted. If the Council came to a decision based upon what might prove to be immature opinions, it might possibly lead to their being scoffed at by what was called the “practical” man. For his own part he declared that, having this report only yesterday put into his hands, he felt great diffidence and apprehension that they might be doing wrong if they committed themselves to it that day. He moved, therefore, that the report be received, but that the adoption of it be deferred for future consideration, and that the Committee be asked specially again to consider the question, and specifically the question of the establishment of a Central Normal School for scientific teaching.

As a matter of fact, it was not necessary that the school should have a farm. The crossing of plants could be explained, and biological knowledge given by the minds that had dealt with that subject, without a farm. A lecture-room was the material part. He apologised for having taken up the time of the Council, which he would not have done unless he had thought it to be the most important question which had come before the Council since he had had the honour of being a member of it. He therefore asked for further consideration of the subject, especially in reference to the scientific teaching of agriculture.

Mr. BOWEN-JONES seconded the

proposition, although he did not altogether agree with Mr. Pell as to the reasons for the establishment of a normal farm. Still, he supported the view which Mr. Pell had put forward, that this subject should be more fully considered. He would have preferred an affirmative vote from the Council that day in favour of a Normal School of Agriculture, but perhaps, considering the magnitude of the subject, it was better that it should be more fully discussed before they arrived at a final decision. He did not for one moment quarrel with the proposition made respecting the establishment of a chair of agriculture at one of the great universities of the country. In fact, he made this suggestion himself when he gave evidence before the Royal Commission on Agriculture, which was so ably presided over by their noble friend and colleague, the Duke of Richmond and Gordon. He did not think that any harm would be done to scientific agriculture in this direction. On the Home Rule principle, he thought they might say that as Scotland had a chair of agriculture established in connection with its University, and that as Ireland had a similar chair, he believed at Glasnevin, and the University of Wales also had a chair of agriculture, it would only be fair to the English section of agriculturists that a similar institution should be raised at one of the great centres of education in this country. But a chair of agriculture at one of their great institutions would be a medium by which agricultural knowledge would be communicated to the landed and higher classes of this country alone.

What he wanted—having considered the matter from a practical point of view—was a system by which the teachers of the future farmers of the country could be trained, and these teachers, who would probably be drawn from the ranks of the elementary schools, would receive both practical and scientific instruction in agriculture that would enable them to impart information to the general rank and file of the middle-class and smaller agriculturists throughout the country at a moderate cost. And if such a school were established, they would be in a better position to attain

that end than would be the case if the teaching were confined to the higher institutions or universities. In that he differed from Mr. Pell. He attached importance to the institution of a farm in connection with this Normal College; he thought that the theoretical knowledge of agriculture would be imparted there, and he thought that the practice of agriculture would be shown to the students by such a college also. It was true that there were great diversities in the practice of agriculture throughout England, but still the various systems of cultivation and the courses of husbandry could be developed at one school, and certainly the different breeds of stock should be concentrated there; and the principles of breeding and the practice of veterinary science also could be gone through by the students at such an institution. Those were the reasons which induced him to attach very great importance to the establishment of this Central Normal School. He saw no reason why they, as Englishmen, should set themselves up as being wiser than other nations of the world. Most foreign countries had these schools. The United States had, he believed, Normal Schools for each State. They made for England the modest request of only one. It should be principally used for the teaching of teachers. Ontario had a school where the practice of agriculture was carried out in much the same manner as that which he had described, and he hoped at some future time that the recommendation of the Joint Committee that a Normal School of Agriculture should be established in this country would be adopted.

Earl CATHERART heartily supported the proposition of Mr. Pell, thinking that, in consideration of the late hour and the importance of the subject, the Council would be inclined to agree with him that postponement was the wisest course.

Mr. DENT pointed out that the matter had been hung up since the meeting of the Council last June. The matter would be left in a very unsatisfactory position, and he thought it was very unfortunate that they could not carry the discussion rather further than they had done.

Mr. BOWEN-JONES suggested that

the matter need not go back to the Committee, but that it should be postponed for further consideration by the Council.

The PRESIDENT said this was a large question, and affected the whole agricultural community of the country; but, in his humble judgment, it was not yet ripe for solution, and he thought that the proposal to leave it in the hands of the Council was the best suggestion. He did not see any object in sending it back to the Committee, who had taken a great deal of trouble over it, and the thanks of the Council were due for the able report drawn up by Mr. Dent. They were not in a position to assure themselves of what the feeling of the country was with regard to this matter. It so happened that on Friday next all the County Councils of England would meet. There was a very large sum of money which the Government, not knowing what to do with it, were going to hand over to the County Councils to be applied to technical education. The consequence of that would be, he ventured to think, that at least eight out of ten County Councils would take up the question of technical education at their next meeting. Of course, the Council would not fold their arms and be indifferent to such a thing as technical education in agriculture. On Friday they would see what was the opinion of the County Councils.

He felt that the Committee was a pretty faithful reflex of the feeling of the Council, and that there was a considerable diversity of opinion in the Council itself as to how to carry out anything like a great scheme of technical education in the country. Although there was an objection raised by Mr. Dent to postponed action, yet there was always safety in further consideration, and he would suggest that Mr. Pell should put his motion in this form: "That the report be received and laid upon the table for further consideration by the Council." He thought that might meet the difficulty. He was not at all satisfied himself upon this great subject of the establishment of a Normal School, and he had voted yesterday in Committee with Mr.

Dent. He held a very strong opinion that if there was a real demand for technical education on agricultural subjects, before very long that demand would be supplied without Parliamentary aid. He was not a strong believer in the expediency or advantage of Government or even Parliamentary sanction. All this was a question of time. They were now wholly in the experimental stage, and he therefore thought a further postponement might assist them in coming to a decision on the subject.

After further discussion, it was resolved that the report of the Education Committee be laid upon the table for further consideration by the Council at their meeting in February next, Mr. PELL giving notice that he would then move, "That the Council approve of a Normal School of Agriculture for Scientific Instruction."

Dairy.

Sir JOHN THOROLD presented the recommendations of this Committee as to the prizes for dairy cattle, cheese, soft cheese, butter, and butter-making, to be offered in connection with the Doncaster Meeting.

Dairy Education.

The SECRETARY read the following letter from the Board of Agriculture, which was ordered to be referred to the Dairy Committee for report:—

Board of Agriculture,
3 St. James's Square, S.W.:
October 28, 1890.

Sir,—The Board of Agriculture, in taking note of the useful work which various societies and institutions have accomplished by means of schools, classes, demonstrations, and systems for imparting dairy instruction, have become aware of the need which exists for some more uniform system of examining the pupils to whom this instruction is given than exists at present. The knowledge acquired by the pupils who have undergone tuition may thus be tested, and an additional means afforded of gauging the comparative value of the very varied forms of instruction given, whether such instruction be purely practical or extended to theoretical teaching.

Apart from any assistance which such an uniform system might afford to the Board when called on to distribute grants, or in any way to discriminate between varying forms of dairy teaching, they are disposed to consider that it would be of great use to all those about to engage skilled hands, whether as practical butter and cheese makers for private or other dairies, or as persons to fill more responsible positions, such as managers of factories, &c., that some uniform test of ability and information should be secured, giving a regular and trustworthy indication of the knowledge possessed by those who seek engagements.

Although the Board have been applied to for aid on behalf of certain existing examinations, they have felt themselves unable to make any grant in aid of such an object, or even to recognise officially the value of any particular examination which may be held, in the absence of some widely representative and responsible body, under whose direction all examinations in dairy work might be held.

It would probably be expedient that the members of such a body should be drawn, not from any *one* society, however good, but from *all* the leading societies in any way interested in the matter.

The expense (other than that met by the institutions undergoing examination) might be defrayed by contributions to a common fund on the part of the societies interested, towards which also, at the discretion of the Board of Agriculture, a grant in aid might be available (so long as such grants are authorised to be made).

The examiners would be empowered to grant diplomas and also certificates, not only for scientific, but for purely practical qualifications, and their awards would be recognised by the Board, who might also require that any dairy institution seeking Government aid should submit its pupils for examination by the members of the proposed examining body, if called upon to do so.

It might be needful to require

that the names of those who would be proposed as possible examiners by the different societies should first be submitted to the Board of Agriculture for approval before they become members of the examining body, while the power to add certain nominated members might be also reserved to the Board.

Although the Board are aware that the Royal Agricultural Society of England is not one of the societies whose work in the promotion of dairy education is assisted by means of Government grants, it has occurred to the Board of Agriculture that the Society might not be disinclined to lend its co-operation in this matter by the selection, from amongst its members, of examiners qualified by their special acquaintance with this branch of agriculture, so as to secure for the projected examining body the highest qualifications it is possible to obtain.

I am desirous, therefore, to ask you to bring under the notice of your Council the suggestions now offered, and to ask you to be good enough to inform me, at an early date, of their views in the matter, accompanied by such observations as they may see fit to offer.

I am, Sir,

Your obedient servant,
(Signed) RICHARD DAWSON,
Assistant Secretary.

The Secretary,
Royal Agricultural Society of England.

Sir JOHN THOROLD observed that the Dairy Committee had already informally discussed this letter, and the members then present were agreed that some such examining body as was suggested was desirable.

Country Meeting of 1892.

The SECRETARY read letters from the Corporation of Gloucester, inviting the Society to hold its Country Meeting of 1892 in that city, and a similar letter from the Corporation of Cheltenham. An invitation from Warwick had already been laid before the Council.

On the motion of Mr. DARBY, seconded by Mr. SANDAY it was re-

solved: "That the following noblemen and gentlemen be appointed a Committee of Inspection to examine and report upon the Sites and other accommodation offered by the various towns from which invitations have been, or may be, received:—The President, the Senior Stewards of Stock, Implements, and Finance, the Honorary Director, Mr. Ashworth, and the Secretary.

International Agricultural Congress at Vienna.

The PRESIDENT observed that, as the Council were aware, the Society was officially represented at the International Agricultural Congress, held at Vienna last September, by their Secretary and Editor. The Society had, he thought, every reason for gratification at its determination to send a delegate to this Congress, which was the largest that had ever been held, the number of members being, indeed, double those of the similar Congress held in Paris in 1878, when the Society was represented by the President of the year—their friend Sir Nigel Kingscote—and many other influential members of the Council, including, at the opening sitting, His Royal Highness the Prince of Wales. Vienna, however, was not so accessible as Paris, and the Congress was held at a later period of the year, so that those members of the Council who were contemplating accompanying the Secretary were unavoidably prevented from carrying out their intention.

The Society had always endeavoured, and with success, to cultivate international relations with other organisations for the advancement of agriculture. Their Secretary had reported that he was everywhere received most kindly and hospitably as the representative of their Society and of English agriculture; and he had brought back with him, not only the most agreeable recollections of his visit, but a great mass of new information about agricultural administration and practice in the Austro-

Hungarian Monarchy, which he would summarise for the Journal, and to which he (Lord Ravensworth) was sure they would all look forward with great interest. Lord Salisbury was good enough to write, both officially and privately, to their Ambassador at Vienna, Sir Augustus Paget, requesting him to give Mr. Clarke the necessary official introductions to the authorities in Austria and in Hungary. In view of the valuable information which their representative, and thus the Society, obtained from the gentlemen to whom he received introductions through their Ambassador, he was sure it would be the wish of the Council that their thanks should be officially recorded, not only to Sir Augustus Paget himself, but to the British Consul-General at Buda-Pesth (Sir Arthur Nicolson); to the Austrian Minister of Agriculture (Count Julius de Falkenhayn); to Chevalier de Blumfeld, of the Austrian Agricultural Department; to Baron Fiath, of the Hungarian Agricultural Department; to Count Nicholas Esterhazy; and to Baron de Hohenbruck and Chevalier Max de Proskowitz, the President and Secretary of the Committee of Organisation of the Vienna Congress.

These votes of thanks were passed unanimously, and the President undertook to communicate them officially to the gentlemen named.

Miscellaneous.

Letters were read from the Board of Agriculture, stating that the Board much appreciated the steps taken by the Society with the view of assisting the Board in carrying out the Fleuro-pneumonia Act of 1890, and from the Devon County Agricultural Association, thanking the Council for the facilities afforded to the Association at the Plymouth Meeting.

Date of next Meeting.

Various other letters and documents having been laid upon the table, the Council adjourned until Wednesday, December 10, at noon.

WEDNESDAY, DECEMBER 10, 1890.

SIR MATTHEW WHITE RIDLEY, BART., M.P. (TRUSTEE),
IN THE CHAIR.

Present:—

Trustees.—General Viscount Bridport, K.C.B., Earl Cathcart, Col. Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart.

Vice-Presidents.—Mr. Walter Gilbey, Sir John Thorold, Bart., Mr. C. Whitehead.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Joseph Beach, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. J. A. Caird, Mr. Chandos-Pole-Gell, Earl of Coventry, Mr. Percy E. Cratchley, Mr. Alfred Darby, Mr. C. de L. P. De Laune, Viscount Emlyn, Mr. S. P. Foster, Mr. William Frankish, Mr. A. Hamond, Mr. C. S. Mainwaring, Mr. Joseph Martin, Mr. P. A. Muntz, M. P. Hon. Cecil T. Parker, Mr. Daniel Pidgeon, Mr. James Rawlence, Mr. S. Rowlandson, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. Alfred J. Smith, Mr. Henry Smith, Sir Joseph Spearman, Bart., Mr. R. Stratton, Mr. Martin J. Sutton, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. C. W. Wilson, Sir Jacob Wilson.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Mr. E. W. Voelcker, Acting Consulting Chemist; Mr. Wilson Bennison, Surveyor.

The following representatives of the Doncaster Local Committee were also present:—The Mayor of Doncaster, Mr. Joseph Firth Clark, Mr. F. Bacon Frank, Mr. John White, Mr. G. T. Wood, Mr. G. B. C. Yarborough, and Mr. George Chafer (Secretary of the Local Committee).

In the absence, through domestic affliction, of the President, Sir MATTHEW RIDLEY was, on the motion of VISCOUNT BRIDPORT, called to the Chair.

The minutes of the Council held on November 5 having been read and confirmed,

The CHAIRMAN said he was sure

every member of the Council would join with him in a feeling of the deepest regret at the sad cause which prevented their President from taking his place in the Chair that day. Lord Ravensworth had been afflicted with the heaviest sorrow that could befall a man, and no words and no resolution of theirs could alleviate it. But it might, he hoped, be some sad satisfaction to Lord Ravensworth in his hour of trial to know that he had the sympathy of every one of his colleagues on that Council. He was confident, therefore, that it would be the wish of every gentleman present that they should pass a resolution of sincere regret at the death of Lady Ravensworth, and of their deepest and most heartfelt sympathy with their President in his affliction.

This resolution was carried unanimously, and the Chairman undertook to communicate it by a personal letter to Lord Ravensworth.

The SECRETARY reported that apologies for non-attendance at the meeting had been received from H.R.H. Prince Christian, His Grace the Duke of Richmond and Gordon, Lord Egerton of Tatton, Mr. Ashworth, and Mr. Dent.

Election of Governors and Members.

The election of the following two Governors and sixty-one members was proceeded with:—

Governors.

HENRY, Mitchell. Kylemore Castle, Galway.
WILLOUGHBY, DE BROKE, Lord. Kington House, Warwick.

New Members.

BAINBRIDGE, J. H. Beechwood, Plympton, Devon.
BARNE, Lt-Col. F. St. John N. Sotterley Park, Wangford.
BEACHELL, W. Rawcliffe, Selby, Yorks.
BEASLEY, J. A. L. Aylestone, Leicester.
BIRKEN, T. I. Ruddington Grange, Notts.
BLAIR, M. Harembre House, Wensley, Bedale.
BLOUNT, Hugh. Stildon Manor, Tenbury.
BRENDON, W. H. Queen's Gate, Plymouth.

BRIGG, T. H...Bradford, Yorks.
 BROWN, John S...11 Morningside, Eccles Old Road, Manchester.
 BUTT, F...Little Haresfield Farm, Stonehouse, Glos.
 CARBRIDGE, G...Ryland's Farm, Elmley Lovett Droitwich.
 CHAPMAN, Evan, Lllysyn, Llandafyl, Mont.
 CHEESMAN, J...Southborough, Mass, U.S.A.
 CHOLMELEY, H. C. F...Brandsby Hall, Easingwold.
 COLE, A. C...West Woodhay Ho., Newbury.
 COOKE, Sir W. R. C., Bart...Wheatley Park, Doncaster.
 COOKE, W. H. C. W...Wheatley Park, Doncaster.
 COURAGE, E. H...Kirby Fleetham, Bedale.
 CRAZE, F...Trevethoe Barton, Leland, Cornwall.
 CROSLAND, W...Buscot Park, Faringdon.
 DABBY-GRAFFITH, C. W...Fadworth Ho., Reading.
 DAVIES, A. J...Upper Hollings, Pensax, Tenbury, Worcestershire.
 FELLOWES, J. H...Mortimer Lodge, Berks.
 GALBRAITH, J...Oroy Cunningham, New Kilmearn, Stirling, N.B.
 GRAVES, W...South Field Ho., Bellerby, Bedale.
 HARRIS, J. W. B...Cam, Dursley, Glos.
 HUGHES, E. T...Pershore.
 ISMAT, T. H...Dawpool, nr. Birkenhead.
 JOICE, James, M.F...Longhirst, Morpeth.
 KIRBY, W. F...Manor House, Walton, Hull.
 LENO, M...Cox Pond Farm, Hemel Hempstead.
 LIVESLEY, Harry...Rotherfield, Sussex.
 LLOYD, E. O. Vaughan...Berth, Ruthin.
 MABSON, Joseph...Ecclesfield, Sheffield.
 McMORLAND, R. E...Carlsbrooke, Bynullah Park, Enfield.
 MEARES, T...Olive Hall, nr. Shrewsbury.
 MICHELMORE, A...Bridgetown, Totnes.
 PEACOCK, T...Hill House, Harby, Bedale.
 PEASE, W...Hutton Hang, Bedale.
 PERKINS, A. F...Oakdene, Holmwood, Surrey.
 PHILLIPS, S. G...Binfield House, Byfleet.
 PRYCE-JONES, Sir Pryce...Dolaw, Newtown, Mont.
 RAW, R...Brook Ho., Middleton Tyas, Richmond, Yorks.
 RILEY, T...Thornton, Poulton-le-Fylde.
 RODNEY, Lord...Berrington Hall, Leominster.
 ROTHWELL, R. R...Sharples Hall, Bolton.
 RUND, Ash, jun...East Ruston, Norwich.
 SIDDALL, V...Wadale Bridge, Sheffield.
 SMART, Rev. E. H...Kirby-in-Cleveland.
 SMITH, Alfred...Cote House, Catterick.
 SMITH, H...Thorpe Hall, Howden, Yorks.
 STEPHENSON, J. W...Metham, Howden, Yorks.
 STYAN, T...Mount Park, Wensley, Bedale.
 THOMPSON, Major G...Field House, Goope.
 THOMPSON, T...Pond House, Bedale.
 TROTTER, A...Dantyre House, Bedale.
 TUBVILL, G...East Worlham, Alton, Hants.
 WADDINGHAM, T. J...Hafod, nr. Aberystwith.
 WEAVER, J. D...Rock Farm, nr. Stourport.
 WHITEFIELD, W...Weston Cotton, Oswestry.

The reports of the various Standing Committees were then presented and adopted as below :

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the balance sheet for the Plymouth Meeting had been examined and passed by the auditors on November 17, and that the net

excess of expenditure over receipts was 2,197*l.* 7*s.* 1*d.*, exclusive of the premiums paid to thoroughbred stallions in District D. The Committee recommended that Messrs. Beckett and Co. be appointed the Society's local bankers for Doncaster. In view of the small sale of season tickets which had of late taken place in consequence of the granting of free tickets to the subscribers to the local fund, the Committee did not advise that any season tickets be placed on sale for the Doncaster Meeting. The Committee recommended that the names of one life governor, five life members, and twenty-one annual members who were deceased, nine who had resigned, six whose addresses could not be found, and twenty-three in arrears, or sixty-five in all, be struck off the register. The accounts for the month of November, as certified by the Society's accountants, had been laid upon the table and approved. The total receipts during the month were 1,856*l.* 6*s.* 5*d.*, and the expenditure was 2,317*l.* 12*s.* 11*d.* The balance at the bank at the end of November, allowing for cheques outstanding, was 2,097*l.* 0*s.* 6*d.* Accounts amounting in all to 2,329*l.* 13*s.* had been passed, and were recommended for payment. The Committee had held during the year fourteen meetings (including five special), and had made nine reports to the Council. They did not recommend any change in their constitution for the forthcoming year.

Sir NIGEL KINGSCOTE observed that the Council would note from the report of the Finance Committee that for various causes the Committee had found it necessary to strike off from the register a further sixty-five members, making altogether a total of 290 members who had been struck off since the General Meeting in May last. Happily the effective strength of the Society had not been materially diminished by these reductions, as a total of 233 subscribers to the Society had been elected during the same period. The Committee deemed it necessary, however, to remind the Council and the members generally, that the maintenance of the Society's operations upon their present scale

* Re-instated under By-Law 12.

depended upon a continued flow of new subscribers. At least 500 new members needed to be elected every year to take the place of those who died or retired. The Committee thought it important that particular attention should be drawn to the necessity of each member interesting himself in obtaining new subscribers to the Society, and suggesting the names of any farmers or others interested in agriculture in his district or of his acquaintance who would be likely to become members. They trusted, therefore, that a general effort would be made by members of Council and all those interested in the welfare of the Society to obtain new subscribers to it during the new year which was just upon them.

It was agreed that a paragraph to this effect should be inserted in the report to the General Meeting to be held on the following day.

House.

Sir NIGEL KINGSORE (Chairman) presented the recommendations of this Committee as to various matters connected with the House arrangements and the Council Chamber.

Journal.

Earl CATHCART (Chairman) reported that the Committee had passed and referred to the Finance Committee various accounts for printing, &c., in connection with the Journal, and had had under further consideration the question of a renewal of the present contracts for the various descriptions of the Society's printing, which expire on the 31st instant, and on which they presented their recommendations.

The Committee recommended the acceptance of Messrs. Spottiswoode and Co.'s tender to bind each year's numbers of the Journal for members at the price of 2s. per volume, to include packing in boards for safe transmission, and free delivery of the bound volumes back to the members, and to supply the cover separately, without binding, at the price of 1s., delivered free by post. The Editor had submitted his proposals for the contents of the next number of the Journal, to be published on the 31st inst., which were approved. It had been agreed that Professor Crookshank

should be asked to write for the first number of the Journal next year an article on tuberculosis in animals and its connection with Dr. Koch's discoveries. The Secretary had been authorised to purchase for the library a German Encyclopædia of Agriculture and Stock-breeding, of which specimen parts had been submitted to the Committee.

The Committee had met nine times and made nine reports, and they did not recommend any alteration in their constitution for the ensuing year.

Chemical.

Viscount EMLYN (Chairman) stated that the report of the Woburn Sub-committee had been received and adopted, and that the draft quarterly report had been considered, and with some amendments adopted.

The Committee had met eight times and had made eight reports. They recommended that the names of Messrs. Sutton and Terry should be added to the Committee to fill vacancies.

On the motion of Viscount EMLYN, it was resolved that the quarterly report of the Chemical Committee be adopted, and published in the usual manner. [See page 847.]

Seeds and Plant Diseases.

Mr. CHARLES WHITEHEAD (Chairman) reported that the annual reports of the Consulting Botanist and Consulting Entomologist had been considered, and were recommended for publication in the next number of Journal [see pages 834 and 844]. Of the 100% granted by the Council for investigations into the composition of ancient pastures, 48l. 15s. had been already expended. The Committee had referred to the Education Committee a suggestion by their Chairman that the subject of fruit farming should be added to the syllabus of the Senior Examination. They had had under consideration a proposal to issue diagrams of grasses and of the stages in the growth of wheat, and had requested the Consulting Botanist to bring up at the next meeting a detailed recommendation upon the subject.

The Committee had met eight times and made eight reports, and they

recommended that for the ensuing year they be constituted as before, the name of Mr. Wheeler being added to fill a vacancy.

Veterinary.

Sir JOHN THOROLD (Chairman) stated that Professor Brown had presented the following report:—

PLEURO-PNEUMONIA.—In the four weeks ended November 29th, twenty-seven fresh outbreaks of this disease occurred in Great Britain, in the counties of Aberdeen, Edinburgh, Essex, Lanark, Lancaster, London, Middlesex, Renfrew, and York (N.R.). During this period about 1,755 cattle were slaughtered by order of the Board of Agriculture; this includes the actually diseased animals, and also those which had been in contact with them, or otherwise exposed to the risk of infection.

ANTHRAX.—During the month of November sixteen fresh outbreaks of anthrax were reported in Great Britain, fifteen of them in England, in the counties of Cornwall, Hants, Lancaster, Lincoln (Holland), Norfolk, Northampton, Nottingham, Sussex (East), Wilts, and York (W.R.). The outbreak in Scotland took place in Wigtownshire. The total number of animals attacked was fifty-five—viz. fifty-one in England and four in Scotland. One diseased animal was killed, fifty-four died, and one recovered.

SWINE FEVER.—The total number of outbreaks of this disease reported in Great Britain during November was 401, or an average of 100 per week. This is a considerable decrease as compared with the weekly returns for the third quarter of the year, in which the average was over 130 per week. The number of pigs attacked in the four weeks was 3,255; the number of diseased pigs killed was 1,413, while 1,884 diseased swine died, 227 recovered, and 761 remained alive when the last published return was made up.

Experiments are now being carried on at the Royal Veterinary College to test the alleged conta-

gious nature of Foot-rot; and a flock of sheep, among which the disease exists, is under observation. Investigations into the life history of the lung-worm in lambs and calves are not yet completed, but a report on the results of the inquiry up to the present time will be included in the Annual Report of the College for the year 1890.

In reference to the treatment of the lung-worm disease, it may be remarked that the well-known remedies, oil of turpentine, carbolic acid, sulphuric ether, and chloroform have been used for some years with a fair degree of success, provided that the medical treatment has in all cases been supplemented by good management, liberal rations, and shelter from cold and wet. A mixture containing ten to fifteen drops of carbolic acid, chloroform fifteen to twenty drops, turpentine twenty to thirty drops, with one to two tablespoonfuls of olive oil, may be given—the smaller doses to a lamb, and the larger to a calf—every day for three or four days in succession with advantage.

An application has been made for a sufficient quantity of Dr. Koch's lymph to test its action on tuberculous cattle, chiefly with a view to the diagnosis of the disease, in which, judging from experiment on small animals and in the human subject, it promises to afford very valuable aid.

The Committee had further considered the question of Foot-rot in sheep, and the experiments which had been carried out at the Royal Veterinary College as to its contagious or non-contagious character. A discussion had arisen upon Dr. Koch's recent discoveries in their relation to tuberculosis in the lower animals, and it had been agreed to represent to the Journal Committee the desirableness of an article or articles in the Journal, detailing the experiments which had already been carried out in this country, and giving the results of any experiments that might in future be made with Dr. Koch's lymph, when a supply should have been procured. Professor Crookshank undertook to pre-

pare these articles if requested to do so by the Journal Committee. A letter had been received from the Executive Committee of the proposed British Institute of Preventive Medicine, appealing to the Society for pecuniary assistance in support of the Institute, which was intended to deal with the prevention and cure of the infectious diseases of the domestic animals as well as those of man. The Committee recommended that the Secretary be instructed to reply that the Society was already engaged in the prosecution of researches similar to those proposed to be carried on by the Institute, by means of its annual grant to the Royal Veterinary College, and that while the Council had every sympathy with the objects of the Institute, they did not see their way to make further grants of money for the purpose indicated in the appeal.

A letter had been received expressing the willingness of the Farriers' Company to provide the two first prizes of £1. each, together with the Freedom of the Company, in the horse-shoeing competition at Doncaster: and the Master of the Company had verbally reported to the Committee that the General Registration Committee would admit to the Register of Shoeing Smiths, without charge, all the prize-winners and commended competitors in the same competition. The thanks of the Society were ordered to be sent for these offers, of which the Committee recommended the acceptance.

A letter had been received from Mr. O. Hedworth Gollidge, accepting the appointment of Provincial Veterinary Surgeon for the county of Dorset, in succession to Mr. Vessey, resigned. All the 500*l.* voted to the Committee for the current year had been granted to the Royal Veterinary College, and the Committee had incurred additional expenses to the amount of 55*l.* 0*s.* 5*d.* They moved for a grant for the year 1891 of 600*l.*, of which 500*l.* should be allocated to the Royal Veterinary College for the study of comparative pathology and bacteriology.

The Committee had met eight times and made eight reports, and they recommended that for the en-

suing year they be constituted as before, with the addition of Mr. Beach and Mr. Terry to fill vacancies.

Stock Prizes.

Mr. SANDAY (Chairman) reported that the Committee had had before them a voluminous correspondence respecting two of the entries of Jersey cattle, made by Mr. W. D. Tucker, of Southampton, at Plymouth, and the exhibition of such animals at local shows in the Island in the names of other persons, after Mr. Tucker had certified that they were his property. The Committee could not regard as completely satisfactory the explanations which had been given of such exhibition in the Island; but in face of the statutory declarations of Mr. Tucker and the breeders of the two animals in question that they were Mr. Tucker's property when he entered them for Plymouth, the Committee felt that the matter could not now be carried further. The facts reported showed, however, gross carelessness on the part of certain Jersey exhibitors in the making of entries for shows, and a reprehensible looseness in the filling up of the so-called 'breeder's certificates.' The Committee recommended that in future no entry of an animal of the Channel Island breeds be accepted, unless the Official Herd-book Importation Certificate be produced to the Secretary at the time of entry. Also that the Secretary be empowered to decline without correspondence any entry of live stock, the certificate of which does not fully comply with the Society's regulations when it is sent in. A letter had been received from the President of the Royal Jersey Agricultural Society assuring the Council of their readiness to co-operate at once with them in any investigation they might deem it necessary to make in the matter above referred to, and stating that the Committee of the Society viewed favourably the proposed new regulation respecting the entries of animals of the Channel Island breeds. The thanks of the Society were ordered to be sent for this communication.

The Second Prize winner, No. 494 in Class 64. (Devon Cows or Heifers

in-milk or in-calf), Mr. E. J. Stanley's *Moss Rose 11th*, having failed to comply with the regulations of the Plymouth Prize Sheet, was disqualified from receiving the prize. The following were the animals which, in consequence of this disqualification, succeeded to the prizes, being duly qualified therefor:

Class 64. SECOND PRIZE of 10*l*. to Mr. Alfred C. Skinner for *Duchess 17th* (awarded Third Prize).

THIRD PRIZE of 5*l*. to Sir William Williams for *Flame 3rd* (Reserve Number).

A letter had been read from the English Jersey Society, asking the Committee to receive a deputation on the subject of separate classes for Island-bred and English-bred animals; and the Secretary had been instructed to inform the Society of the prizes for Jerseys which this Society proposed to offer at Doncaster, and to state that the Council, being fully in possession of the views of the English Jersey Society, did not see that any advantage would be likely to accrue from an interview with the Stock Prizes Committee. A memorial had been read from the Cleveland Bay Horse Society, asking the Society to provide separate classes for Cleveland Bays and Coach-horses. The question had been discussed by the Local Committee who were giving the prizes for Coach-horses; but that Committee had not seen the necessity for separate classes. A variety of letters making suggestions as to the Stock Prize Sheet had been considered, and directions given thereon. The Committee, having again gone carefully through the proposed classes and regulations of the Stock Prize Sheet for the Doncaster Meeting, recommended that the prize sheet, as now settled by them, be approved and issued forthwith, power being reserved to the Chairman and the Secretary to accept champion prizes, which might be offered before the prize sheet was printed, and which complied with the Society's regulations.

The Committee had met eight times, and had made eight reports, and recommended that the Com-

mittee for the ensuing year be constituted as before, with the addition of Lord Brougham and Vaux and Mr. Terry.

Considerable discussion arose on the proposed omission of the classes for Two-shear Rams, in which Mr. BOWEN-JONES, Mr. SANDAY, Mr. MUNTZ, Mr. STRATTON, Sir JACOB WILSON, Mr. GILBEY, and Mr. FOSTER took part, and Mr. BOWEN-JONES moved "that the Two-year-old sheep prizes remain as at present"; but eventually the adoption of the Prize Sheet, as revised by the Stock Prizes Committee, was carried by 17 votes to 12.¹

The SECRETARY read communications (1) from the Hackney Horse Society offering two of the Society's Gold Medals, one for the best Hackney stallion and one for the best Hackney mare; (2) from the Shorthorn Society offering two pieces of plate of the value of 25*l*. each for the best male and best female Shorthorns to be exhibited at the Society's Meeting at Doncaster next year.

On the motion of Mr. SANDAY, these prizes were accepted with thanks.

Implement.

Mr. FRANKISH (Chairman) reported that the Committee had settled the regulations for the trials of Cream Separators at the Doncaster Meeting, and recommended that the points representing perfection be fixed as follows; both for power and hand machines:—

1. Price	10
2. Power taken per gallon	20
3. Efficiency of separation	20
4. Means of regulating thickness of cream	10
5. Facility for dismantling and cleaning	15
6. Mechanical construction	15
7. Freedom from froth, both of skim-milk and cream	10
	100

The Committee recommended that the points for mechanical milking machines be determined by the Judges in consultation with the Stewards before the trials, the Council reserving the right to defer the trial of such machines.

The Committee had met eight times and made eight reports, and they re-

¹ This decision was reversed at a Special Meeting of the Council held on December 18 (see page covi).

commended that the Committee for the ensuing year be the same as before, with the addition of Mr. Beach.

General Doncaster.

LORD BRIDPORT reported that the Committee had further considered the list of prizes proposed to be offered by the Local Committee, and they recommended it, with a small modification, for approval. The Surveyor had submitted a plan of the Doncaster showyard, and the Local Committee had undertaken to lay the road across the racecourse to the entrance for visitors and implements, and would endeavour to make an additional road across the course by the grand stand. The Committee recommended that a band be provided at the Doncaster Show.

Showyard Works.

SIR JACOB WILSON (Chairman) reported that the Surveyor had submitted a plan for the Doncaster showyard, and also a plan for the erection of the Dairy, which the Committee recommended for approval. The Committee had met nine times, and made nine reports. They recommended that the Committee for the ensuing year be constituted as before, except that the name of the Hon. Cecil T. Parker be added to fill a vacancy.

Selection.

The recommendations of this Committee having been read,

EARL CATHCART said that at the last meeting of the Council a general wish was expressed that His Royal Highness Prince Christian should be requested to accept the post of one of the Vice-Presidents of the Society. Accordingly, the President placed himself in communication with Prince Christian on the subject, and the Committee had the gratification of announcing that His Royal Highness had expressed his willingness to accept office. He, therefore, had great pleasure in proposing for their acceptance the necessary formal resolution: "That His Royal Highness Prince Christian of Schleswig-Holstein, K.G., be elected a Vice-President of the Society."

SIR JACOB WILSON seconded the motion, which was carried unanimously.

EARL CATHCART reported the recommendation of the Committee that Mr.

Wheeler be appointed a Steward of Stock, and Mr. Pidgeon a Steward of Implements, and that to fill the places of Mr. Stratton, Mr. Mainwaring, and Sir Jacob Wilson, who retired from the Committee by rotation, Sir John Thorold, Mr. Neville-Grenville, and Mr. Crutchley be appointed. The Committee also presented their recommendation of a new member of Council in the room of H.R.H. Prince Christian, elected a Vice-President. The Committee had met six times, and made six reports during the year.

Education.

MR. MAINWARING reported that of the forty-two candidates from the fourteen schools entered for the Society's Junior Examinations on the 11th and 12th ult., forty actually presented themselves. Of these, sixteen had obtained the number of marks necessary to qualify them for the Society's scholarships and certificates, in the event of their complying during the forthcoming year with the conditions of the examination. The Committee presented a report upon the results of the examinations, which they recommended should be published in the next number of the Journal [see page 854]. The addition of the subject of fruit-farming to the syllabus of the Senior Examination had been suggested by Mr. Whitehead: and the Committee proposed to give further consideration to the desirableness of adding to this syllabus a group of special subjects, to comprise dairying, forestry, fruit-farming, &c.

Various letters on the subject of technical agricultural education were submitted, and directions given thereon. Of the 500*l.* granted to the Committee for the current year, 355*l.* 9*s.* had been expended—viz. 125*l.* 19*s.* 9*d.* for the Senior Examination, and 22*l.* 14*s.* 2*d.* for the Junior Examination. The Committee moved for a renewal of their grant of 500*l.* for the year 1891.

The Committee had met five times and made five reports, and they recommended that they be reconstituted for next year as before, with the addition of the names of Messrs. Arkwright, Pidgeon, and Sutton, and Major Craigie

Dairy.

THE HON. CECIL T. PARKER (Chairman) reported that the letter from

the Board of Agriculture [see page ccxv] as to the formation of a general representative Board of Examiners in Practical and Scientific Dairying, which had been referred to the Committee by the Council at their last meeting, had received careful consideration. The Committee were entirely agreed that some such examining body was advisable, and they recommended that the Council should co-operate with the Board of Agriculture in any steps that might be taken in this direction. The proposed regulations in the draft prize sheet relating to poultry, butter, cheese, and butter-making competitions, and the trials of cream separators and milking machines, had been amended and approved. Of the 100*l.* granted to them for 1890, the Committee had expended 35*l.* 18*s.* 11*d.* They asked for a renewal of the grant of 100*l.* for the ensuing year.

The Committee had met six times and made six reports, and they recommended that the Committee for 1891 be, with one exception, constituted the same as last year.

Hunter Stallion.

The Earl of COVENTRY, in the unavoidable absence of the Chairman of the Committee (the Duke of Richmond and Gordon), reported the recommendations of the Committee that the three premiums granted by the Society, amounting to 600*l.*, be paid direct to the owners of the winning horses by the Society, all other arrangements being undertaken by the Royal Commission on Horse Breeding; that the Society's three premium stallions be exhibited in the Doncaster showyard from 9 a.m. on the Monday of the show to 5 p.m. on the Wednesday; and that the three Gold Medals offered by the Doncaster Local Committee be presented at the general meeting in the Showyard as usual.

Standing Committees.

The following Standing Committees were appointed for 1891, viz:—

Finance.	Stock Prizes.
House.	Implement.
Journal.	General Doncaster.
Chemical.	Showyard Works.
Seeds and Plant Diseases.	Selection.
Veterinary.	Education.
	Dairy.

Committee for Selection of Judges.

On the motion of Sir JACOB WILSON, a Committee was appointed to recommend Judges of Stock, Implements, and Produce at the Doncaster Meeting, such Committee to consist of the members of the Stock Prizes Committee and the Stewards of the several departments, and to sit for the first time in February next.

Country Meeting of 1892.

The SECRETARY reported that a letter had been received from the Town Clerk of Cheltenham, stating that the Corporation of that Borough desired to withdraw their application to the Society, and to join the City and County of Gloucester in asking the Society to hold their Country Meeting for the year 1892 in or near the City of Gloucester. This reduced the number of towns who had sent invitations to the Society to two, viz. Warwick and Gloucester, and the Inspection Committee appointed at the last Council meeting were intending to make their visit of inspection in the last week in January, in order to bring up a report to the meeting of Council on February 4.

It was resolved that the deputations from Warwick and Gloucester should be received by the Council at 12.15 p.m. on that date.

Miscellaneous.

A letter from the Marquis of Tavistock, expressing his desire to retire from the Council, was read and referred to the Committee of Selection.

Letters of thanks were read (a) from the Royal Commission on Horse Breeding for the Society's grant of 600*l.* for premiums to thoroughbred stallions in 1891; (b) from Baron von Hohenbruck and Chev. Emanuel von Preskowetz, Sen., for their election as Honorary Members.

Date of Next Meeting.

The report from the Council to the general meeting having been prepared, the Council adjourned over the Christmas recess until Wednesday, February 4th, 1891.

THURSDAY, DECEMBER 18, 1890.

THE DUKE OF RICHMOND AND GORDON, K.G. (TRUSTEE), IN THE CHAIR.

IN pursuance of a requisition signed, in accordance with Bye-law 27, by a Trustee, a Vice-President, and three other Members of Council, a Special Meeting of the Council, convened by circular, was held on Thursday, December 18, 1890, to consider the desirability of restoring to the Doncaster Prize Sheet the nine classes for Two-shear Rams, which had been struck out on the recommendation of the Stock Prizes Committee.

The following Members of Council were present:—

Trustees.—Earl Cathcart, Col. Sir Nigel Kingscote, K.C.B., The Duke of Richmond and Gordon, K.G.

Vice-President.—Mr. Walter Gilbey.

Other Members of Council.—Mr. Joseph Beach, Lord Brougham and Vaux, Mr. Percy E. Crutchley, Mr. Hugh Gorringe, Mr. Charles Howard, Mr. P. Albert Muntz, M.P., Mr. G. H. Sanday, Mr. A. J. Smith, Mr. Martin J. Sutton, Mr. Joseph P. Terry, Sir Jacob Wilson.

In the absence of the President, the Duke of RICHMOND AND GORDON was called to the Chair, on the motion of Sir NIGEL KINGSCOTE, seconded by Mr. CHARLES HOWARD.

The SECRETARY read the Bye-law (27) governing the holding of Special Meetings of the Council, and the requisition under authority of which the Meeting had been convened. He also read letters referring to the subject for discussion from the Earl of Ravensworth (President), Sir Matthew Ridley, the Hon. Cecil T. Parker, Mr. Chandos-Pole-Gell, Mr. Frankish, Mr. Mainwaring, Mr. Stratton, Mr. Garrett Taylor and Mr. Christopher Wilson.

Mr. SANDAY said it might perhaps be convenient that before the general discussion took place, he should explain the reasons which had actuated the Stock Prizes Committee in striking out the prizes for Two-shear Rams. It had been said that they were acting somewhat hastily

and inconsistently in doing this; but he could not himself see that this was the case, as the question had been brought forward at the Stock Prizes Committee meeting so far back as November of last year (1889), when the Plymouth Prize Sheet was being settled. At that meeting a motion had been made that classes for Ram Lambs should be substituted for those for Two-shear Rams, and notice of this was sent to every Member of Council. The subject was discussed again at the meeting of the Stock Prizes Committee held in December 1889; but as there was not at that time any great necessity for cutting down the Prize Sheet, the proposal was withdrawn for the time being. This year, however, the Prize Sheet had reached such dimensions that when it came to be looked into it was evident that reductions must be made somewhere; and the Stock Prizes Committee, when they met last week, were confronted with the necessity of effecting economies by striking out some of the classes. Horses they felt they could not touch, as the great bulk of the prizes were given by the Local Committee. Cattle they reduced by some 180%, but this was not sufficient. They had, therefore, to consider in what way the Sheep prizes, which amounted in all to a very considerable sum, could be cut down. It was felt that in view of the small number of Two-shear-Ram entries as compared with the other Ram classes, and the necessity for encouraging early maturity, the Two-shears rather than the Ram Lambs should be sacrificed, and they arrived, therefore, at the decision to which objection had been taken. Complaint was made of the shortness of the notice given to intending exhibitors, who were already preparing their Two-shear sheep for exhibition at Doncaster. But the Society had very often made considerable changes in the classes given in its Prize Sheet without notice to exhibitors. Up to the Derby Show of 1881 prizes were

given for "Shearing Rams" and "Rams of any otherage." At Reading in 1882, the Council, without any other notice to exhibitors than the issue of its Prize Sheet, reduced the last-named class to Two-shear Rams. At the Preston Show, in 1885, prizes were added on the petition of sheep breeders for Ram Lambs, and he for one thought the time was now come when they should carry the policy of encouraging early maturity a step further by abolishing the Two-shear classes.

Mr. GORRINGE agreed with Mr. Sanday. It had been suggested that instead of the Two-shear classes the classes for the Ram Lambs should be cut out. As a breeder he could never consent to that, as he had done all he could to encourage early maturity. Nearly every breeder would say that, after a sheep which might be exceedingly useful in a flock had been fed and exhibited, to put him up again and show him nearly always rendered him infertile, and spoilt his shape and usefulness thereafter. He might win prizes if forced for two years, but was afterwards too fat for use.

Sir JACOB WILSON said that the convening of the Special Council at the instance of himself and other Members was no doubt exceptional, but he thought the circumstances were so exceptional as to justify it. He felt that the Council were not in possession of all the facts of the case when they passed their resolution of last week. He had then loyally supported the report of the Stock Prizes Committee, in the belief, which he was sure was shared by the Council generally, that cutting down was insisted upon by the Finance Committee. But as he had since learnt that Sir Nigel Kingscote was strongly in favour of their holding their hand as to the Two-shear classes, he felt that it was only fair to exhibitors that a change of this magnitude should not be made—if made at all—without further consideration and full notice. He therefore moved, "That it is advisable to restore the classes for Two-shear Rams to the Doncaster Prize Sheet."

Mr. MUNTZ seconded the motion, saying that he felt very strongly that if there was any section of the Prize Sheet which ought not to be

attacked it was the Sheep classes. They were the most profitable stock which farmers possessed. They did not get the full growth of a sheep until it was something like Two-shear. Many good sheep did not show themselves such until they became Two-shears.

Mr. A. J. SMITH said he should be very sorry to see the Lamb classes struck out. It would be more constitutional to strike out the old sheep, because the whole of the business of graziers had lately been to get early maturity. No foreigner would look upon an old sheep as a purchase.

Sir NIGEL KINGSCOTE said he took no part in the discussion on that subject last week, because he did not then fully appreciate the serious consequences of what was being decided. When he did learn, after the discussion was over, what was happening, and that the older sheep were to be struck out of the Prize Sheet, he saw at once that a great injury would be done to the breeders by so little notice being given. He did not then wish to enter into the question as to the Ram Lambs or the older sheep. His own individual opinion was against striking out the Two-shear Rams. He would rather see the Ram Lambs taken out than the Two-shear Rams. No one wished to see early maturity more than himself; but they gave prizes for breeding animals and not for fat ones. Many breeders kept their sheep with the prospect of showing them again, and he did not think they should now deprive them of the opportunity of competing at Doncaster. He should much regret if that day they had a divided Council, and he hoped that they would come to an unanimous decision upon the subject.

Mr. HOWARD admitted that there was very great force in what Mr. Sanday had stated about the classes for the Two-shear Rams. There was a strong and growing feeling in the country against giving prizes for old animals—a feeling in which he participated. For his own part he was very strongly in favour of discontinuing prizes for old sheep, but keeping on with Ram Lambs. But he felt due and proper notice should be given of

any changes, and he did not think that sufficient notice had been given. He fully believed that many breeders had already begun to prepare animals for the Doncaster Show.

EARL CATHCART, without expressing an opinion one way or the other, said he signed the requisition in order that the matter might be thoroughly discussed, as he was always in favour of the fullest inquiry.

Mr. GILBEY thought that a serious step like striking out classes for Two-shear Rams in nine different breeds of sheep should not be taken without previous notice.

Mr. BEACH, having had considerable experience of the breeding and showing of sheep and lambs, thought it would be a great pity if the Society struck out the Two-shear Rams. He disagreed with the view that the farmers took no interest in old sheep, or that they preferred the young sheep to the old. Farmers took a great interest in showing sheep at maturity, and he would point out that at Plymouth a Canadian purchased a Two-shear Ram at a cost of 200 guineas.

Mr. SANDAY said that after the expression of opinion made by Sir Nigel Kingscote, he should not offer any opposition to Sir Jacob Wilson's motion, though personally he still thought the Stock Prizes Committee did right.

The CHAIRMAN said that no one had greater respect for the Stock Prizes Committee than he had, and it was a grief to him to find himself compelled to take a course which to a certain extent was opposed to the resolution which they had come to. His impression was that until they got a sheep to be about Two-shear, they could not tell what he was. They could not tell what ram to put to a certain class of ewe in order to correct some malformation or want of shape.

They would, therefore, do a great injury to the country if they did away with the Two-shear sheep and gave prizes only to the One-shear rams.

Then, again, he did not at all agree that the foreigners did not care for the old sheep. He found that they did care for them very much. It would be a great injury and grievance to the flock-masters of the country if the Two-shear sheep were expunged from the Prize List by the action of the last Council. He would not go into the question of what might be done in future. That was a matter which would receive ample consideration and discussion. But feeling strongly, and being, he might say, greatly interested in the matter, he hoped very much that the Council would see its way to restore these classes to the Doncaster Prize Sheet.

After some discussion as to the amount of the prizes to be offered, in which Mr. SANDAY, Sir JACOB WILSON, Sir NIGEL KINGSCOTE, Mr. MUNTZ, Mr. HOWARD, Mr. TERRY, Mr. CRUTCHLEY, Mr. SUTTON, EARL CATHCART, Mr. GILBEY, LORD BROUGHAM AND VAUX, the CHAIRMAN, and others took part, it was agreed that, in the event of Sir Jacob Wilson's resolution being carried, the prizes originally proposed to be offered for Two-shear Rams would be restored.

Sir Jacob Wilson's resolution was then put to the meeting, and carried *nem. con.* The Secretary was thereupon authorised to insert in the Doncaster Prize Sheet prizes of 15*l.*, 10*l.*, and 5*l.* for Two-shear Rams of each of the following breeds of sheep: Leicester, Cotswold, Lincoln, Oxford Down, Shropshire, Southdown, Hampshire Down, Suffolk, and Wensleydale.

Authority was also given to insert in the Prize Sheet offers which had been received from the Clydesdale Horse Society, of two Champion Prizes of 25*l.* each, for the best Clydesdale stallion and for the best Clydesdale mare or filly, and from the Red-Polled Society of a Champion Prize of 10 guineas for the best Red-Polled animal in the Doncaster Showyard.

The proceedings then terminated, the Council adjourning until Wednesday, February 4, 1891.

Proceedings at Half-yearly Meeting of Governors and Members,

HELD IN THE HALL OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY,
20 HANOVER SQUARE.

THURSDAY, DECEMBER 11, 1890.

EARL CATHCART (TRUSTEE) IN THE CHAIR.

Present:—

Members of Council.—Messrs. J. H. Arkwright, J. Bowen-Jones, J. A. Caird, Percy E. Crutchley, C. de L. Faunce de Laune, S. P. Foster, W. Frankish, A. Hamond, Col. Sir Nigel Kingscote, K.C.B. (Trustee), C. S. Mainwaring, Albert Pell, S. Rowlandson, Martin J. Sutton, Sir Jacob Wilson.

Members.—Messrs. A. Arkwright, R. C. Asheton, George Barham, Thomas Bell, H. F. Cox, James Farmer, J. Kersley Fowler, W. W. Glenny, W. Hallifield, C. H. Hooper, Surgeon-Major Ince, M.D., Messrs. J. W. Kimber, E. Powell King, F. King, Charles Laurie, W. Lipscomb, J. R. Markby, R. Jasper More, M.P., J. B. Paynter, Rev. T. B. Paynter, Messrs. F. Proctor, R. Henry Rew, E. Riley, E. S. Rodd, W. Barrow Simonds (Foundation Life Governor), Clement Stephenson, Thomas Stirton, Leonard Sutton, John Thornton, H. J. Tolle-mache, M.P., Howard Thomas, F. Walker-Jones, Dr. H. J. Webb, Messrs. John White, G. D. Yeoman.

Officers.—Mr. Ernest Clarke, Secretary and Editor; Mr. E. W. Voelcker, Acting Consulting Chemist.

EARL CATHCART, in taking the chair, said he was there by desire of the Council to take the place of their President, who was unhappily absent owing to a most grievous affliction. He was quite sure that the President would have all their sympathies.

The half-yearly report of the Council [see page 824] having been taken as

read, the CHAIRMAN said he would simply glance at the salient features of the report, and the Secretary would if desired read *in extenso* any particular paragraph. First of all they had to regret, and deeply regret, the loss by death of a great many members. There were two names especially which he should like to mention, because they were so closely associated with their sympathies, and lately with the business of the Society, viz. Mr. Joseph Druce, who had an hereditary interest in the Society, and who was a most agreeable colleague; and another member of their Council to whom they were all greatly attached, Mr. Robert Leeds. He was sure that every one shared with him in the great regret with which they read the notice of their deaths in the report. These were both old familiar faces, that he had known for years and years.

The present state of the Society must be to them all a subject of gratification and satisfaction. The muster-roll, which had certainly never been exceeded, showed a grand total on the register of 10,924 members (cheers). In reference to the Plymouth Meeting, they had had fine weather and fine exhibits; all that was required to make the thing perfect was a fine balance-sheet. But if they had lost money at Plymouth, they had expended that money with great advantage. At Doncaster they looked forward to a "bumper." It was right that the great liberality of the Doncaster Local Committee should be acknowledged. They had come

forward with no less a sum than 865*l*. to be devoted to horses, and they had also undertaken to provide the Gold Medals for the Society's premium stallions which were to travel in the neighbourhood. He need not go into the subject of the grant of 600*l*. which had been made by the Society in aid of the Government enterprise with regard to stallions, because the whole of that 600*l*. was really not expenditure. No part of that sum would be spent in those unpractical shows which they used to have, when a number of really very inefficient animals were presented to the unadmiring gaze of those who came to look at them. He thought the members would observe with satisfaction the paragraph referring to the inauguration of the scheme for the examination and registration of farriers. Some day he hoped they would be able to take up the foot of a valuable horse without finding that the whole of the frog, which Nature intended to be for the preservation of the horse, had been cut away by a blundering blacksmith.

The paragraph with regard to the Royal Veterinary College and the Veterinary Officers of the Society showed that they were quite alive to what was going on in the world, and to the essential importance of keeping pace with the times. It had been well said that where a medical man did not go forward, he certainly went backward. The paragraph referring to the Chemical Department showed that people still persisted in purchasing impure cakes and feeding stuffs. If all customers were wise, there would be no fraudulent manufacturers and no fraudulent dealing, because if the customer would only do what was suggested by the Society he would have the remedy in his own hands. The Botanical work of the Society was satisfactory, and every member of the Society would admit that great things had been done lately in the way of improving the samples of seeds that had been sent out. The same remark applied to the Entomological work. Great advantage had been derived from many of those leaflets circulated, and from the information not only sent out by the Royal Agricultural Society but

also by the Board of Agriculture. No more valuable official than Miss Ormerod, their Consulting Entomologist, had ever been attached to a great Society.

The members would observe, he hoped with approval, that a very lively interest was being taken by the Council in educational matters. There was to be a great discussion on the subject in February next, opened by a friend of his own, Mr. Albert Pell. Technical education in agriculture was now attracting very great attention in this country, and it was being considered both by that Society and by the Board of Agriculture. In this they were only following in the wake of nations, especially Scandinavian nations, that were long ago alive to the importance of the subject. Only the other day he had travelled across Denmark, and was perfectly astonished that, in apparently so infertile a country, the inhabitants could possibly compete, and compete successfully, with England. The only reason for it was that the Danes had the greatest regard for and appreciation of technical education.

With regard to the paragraph in the report relating to the Journal, he was perfectly at home, because he had for so many years been associated with it. He appealed to anybody, whether practical, scientific, or literary, who was at all impartial, as to whether this first annual volume of their new Journal would not compare favourably with anything that the Society had ever produced before. It was a publication worthy of that Society. He wished to say this because the matter had been called in question in the press and elsewhere. He himself and his colleagues had virtually nothing to do with the production of a Quarterly Journal. It had been forced upon them by the general feeling of the Members, and they had with a new series to meet a general demand. As to the idea of competition with anybody else, that was perfectly unworthy of the dignity of that Society: they did the best they could for the agricultural community. He was bound in justice to say that he thought the Secretary and Editor deserved the very greatest credit. He (Lord Cathcart) thought

more of punctuality than anything else: it had been stated that they could not produce a journal punctually: the Journal had been produced to a day, and in this, as in other respects, great credit was due to the Editor.

The adoption of the report was moved by Mr. THOMAS STIRTON, who referred to its satisfactory nature, though he rather regretted that the number of members had not increased. Still they had had a very great influx during the last few years.

Mr. W. LIPSCOMB seconded the motion with the greatest pleasure, particularly when he saw the interest which was evinced by the Society with regard to technical instruction. Having every possible advantage over other countries in their pastures, in their stock, and he hoped in the intelligence of their agricultural community, not to be instructed in any single branch of that upon which they depended for their living was really a scandal to their country which ought to be removed. This could only be done in the way which the report very admirably set forth. He only wanted to say that—certainly throughout Yorkshire—there was a very extraordinary ignorance of the scholarships which were offered by the Society. He ventured to hint that some steps should be taken to render more public the advantages which youths could have by competing for them. He hoped that if their numbers increased those scholarships might be also increased, because he believed the scholarships coming from the Society were most valuable.

Surgeon-Major INCE urged the futility of attempts to exterminate by slaughter the disease of pleuropneumonia.

Mr. S. P. FOSTER referred to the work of the Aspatia Agricultural College, with which he was closely connected, and which had been very successful, and said that, owing to the money granted by Government, they had been able to give scholarships to poor boys attending their school. The first and second boys in the recent Junior Examinations of the Society would not have been able to attend the College if it had not been for the Government money. Of the

two boys referred to, one was the son of a very poor farmer in Cumberland, and the other the son of a miner.

Mr. BARHAM asked whether the Council had resolved to act upon his suggestion made last May, to have a single catalogue of all the exhibits in the showyard.

The CHAIRMAN replied that it had been so decided, but it had not been considered necessary to mention it in the report, as it was a matter of detail.

Mr. J. KERSLEY FOWLER suggested that attention should be given to the instruction of agricultural children upon various branches of rural knowledge, such, for instance, as an acquaintance with the insects and plants which were valuable or injurious to the agriculture of the district in which they lived.

Mr. CHARLES LAURIE urged the importance of prizes being given to agricultural stallions and mares, as well as for agricultural geldings.

The report of the Council was then unanimously adopted.

Vote of thanks to Auditors.

Mr. J. W. KIMMER moved, Mr. E. RILEY seconded, and it was unanimously resolved, that a vote of thanks be accorded to the auditors, Messrs. Sherborn, Johnson, and Roberts, for their services during the past year, and that they be re-elected.

Suggestions for consideration of Council.

In response to the usual inquiry from the Chair, as to whether any of the members present had suggestions to offer for the consideration of the Council,

Mr. GEORGE BARHAM wished to refer to one important matter which was agitating the agricultural world to a very considerable extent, and to which he found no reference in the report at all, viz. to railway rates. He did not know whether the gentlemen present were aware of the nature of the Board of Trade proposals. They had heard on many previous occasions that the onerous proposals of the railway companies had been superseded by the proposals of the Board of Trade. Those were so ob-

jectionable in their nature that he thought that the Society should use the whole of its influence and do everything that was possible to prevent those rates being made the law of the land. As far as dairy farming was concerned, the Board of Trade proposals practically meant giving the railway companies the power to increase their present rates to the extent of 140 per cent. It seemed to him that this was so serious a matter that it was one which the Society might take in hand, and help the struggling farmer in all parts of the kingdom. He suggested "That a sum not exceeding 1,000*l.* should be expended by the Council, if necessary, for the purpose of protecting the interests of English agriculturists in reference to the proposed revision of railway rates by the Board of Trade."

Mr. ROWLANDSON hoped this question would be taken up. They had already associated themselves with the Mansion House Committee, who were watching the proposals of the Board of Trade very carefully indeed. It would be wise on their part to continue that association and assist the Mansion House Committee. They should look into this question carefully. It was a very important one, especially with regard to the station terminals.

Mr. FRANKISH, as one of the Society's representatives upon the Mansion House Association and as a Member of the Finance Committee of the Society, said he could not see how the Society could give so large a sum as Mr. Barham mentioned, but he thought they ought to give further support to the Mansion House Association, perhaps to the extent of another 100*l.*

Mr. JASPER MORE, M.P., said he was about to introduce a bill into the House of Commons for the purpose of making the sale of corn by weight compulsory, and doing away with the measure as the first step towards uniform weight. As that was a subject exciting a great deal of interest, he asked the Council if they would give any aid, advice, or assistance in the matter.

Dr. INCE suggested occasional meetings for the discussion of subjects of

agricultural importance, and the issue of a weekly Journal.

Vote of Thanks to Chairman.

Mr. JOHN THORNTON moved, and Mr. W. W. GLENNY seconded, a vote of thanks to the Chairman for so ably presiding over the meeting, which was carried unanimously.

The CHAIRMAN replied, saying that all the suggestions made should receive the careful consideration of the Council. With regard to Mr. Lipscomb's observations, advertisements were regularly put in the educational and agricultural papers of the Society's examinations, and not long ago, when the syllabus was revised, it was posted to the headmaster of every grammar school in the kingdom. He would draw Mr. Laurie's attention to the fact that the prizes for agricultural horses were being given by the Local Committee, and he thought the Doncaster people would be credited with being about as much alive to the hippic interest as any people on the face of the earth. The matter referred to by Mr. Fowler was already under the consideration of the Education Committee, and would not be lost sight of by the Council, who were sensible of its importance. With regard to Surgeon-Major Ince's suggestion, the weekly reading of papers had been tried in the past, and absolutely without success; in these days busy men had no time to attend such meetings. With regard to Mr. Jasper More's suggestion, he must remind them of clause 4 of the Charter that no matter referring to ~~the~~ ^{the} Parliament should be taken up by the Society. No doubt Mr. Barham's suggestion with regard to railway rates was very important, and the Council were fully alive to it. They had subscribed 100*l.* to the funds of the Mansion House Association, and had appointed Lord Moreton, Mr. Frankish and the Secretary as their representatives upon the General Committee. He was much obliged for the vote of thanks which they had given him and he had now only to declare the meeting at an end.

The proceedings then terminated.

PRIZE LIST

FOR

DONCASTER MEETING, JUNE 20 to 26, 1891.

HORSES (£1,837).

Class.	HUNTERS.	Prizes		
		1st £	2nd £	3rd £
1	MARE AND FOAL	20	10	5
2	MARE OR GELDING, up to 15 st., foaled 1885 or '86 ¹	40	20	10
3	MARE OR GELDING, up to 12 st., foaled 1885 or '86 ¹	30	10	5
4	GELDING, foaled in 1887 ¹	40	20	10
5	MARE, foaled in 1887 ¹	30	15	5
6	GELDING, foaled in 1888 ¹	20	10	5
7	FILLY, foaled in 1888 ¹	15	10	5
8	GELDING, foaled in 1889 ¹	15	10	5
9	FILLY, foaled in 1889 ¹	15	10	5
10	COLT, foaled in 1890 ¹	15	10	5
11	FILLY, foaled in 1890 ¹	15	10	5

COACH HORSES.

12	STALLION, foaled in 1886, 1887, or 1888 ¹	20	10	5
13	STALLION, foaled in 1889 ¹	20	10	5
14	MARE AND FOAL ¹	20	10	5
15	GELDING, foaled in 1888 ¹	15	10	5
16	FILLY, foaled in 1888 ¹	15	10	5
17	GELDING, foaled in 1889 ¹	10	5	-
18	FILLY, foaled in 1889 ¹	10	5	-

HACKNEYS

19	STALLION, foaled before 1889, above 15 hands	20	10	5
20	STALLION, foaled before 1889, above 14 hands and not over 15 hands	20	10	5
21	STALLION, foaled in 1888 ¹	15	10	5
22	STALLION, foaled in 1889 ¹	15	10	5
23	BROOD MARE AND FOAL, above 15 hands	15	10	5
24	BROOD MARE AND FOAL, above 14 hands and not over 15 hands	15	10	5
25	MARE OR GELDING, above 14 hands, up to 15 stones, foaled in 1885, '86, or '87 ¹	20	10	5
26	MARE OR GELDING, above 14 hands, up to 12 stones, foaled in 1885, '86, or '87 ¹	20	10	5
27	FILLY, foaled in 1888 ¹	15	10	5
28	FILLY, foaled in 1889 ¹	15	10	5

*Two Champion Gold Medals are offered
by the Hackney Horse Society for the best
Stallion and Mare.*

Class	PONIES.	Prizes		
		1st £	2nd £	3rd £
29	STALLION, not over 14 hds.	15	10	5
30	BROOD MARE AND FOAL, not exceeding 14 hands	15	10	5
31	MARE OR GELDING, above 13 and not over 14 hands ¹	10	5	-
32	MARE OR GELDING, not exceeding 13 hands ¹	10	5	-

HARNESS HORSES AND PONIES.

33	MARE OR GELDING, of any age, exceeding 14 hands ¹	15	10	5
34	MARE OR GELDING, not exceeding 14 hands ¹	15	10	5

SHIRE.

35	STALLION, foaled in 1888	20	10	5
36	STALLION, foaled in 1889	20	10	5
37	STALLION, foaled in 1890	20	10	5
38	MARE AND FOAL	20	10	5
39	FILLY, foaled in 1888	15	10	5
40	FILLY, foaled in 1889	15	10	5
41	FILLY, foaled in 1890	15	10	5

*Two Gold Medals value 15 gs. each are
offered by the Shire Horse Society for the
best Shire Stallion and Mare or Filly.*

CLYDESDALE.

42	STALLION, foaled in 1888	20	10	5
43	STALLION, foaled in 1889	20	10	5
44	STALLION, foaled in 1890	20	10	5
45	MARE AND FOAL	20	10	5
46	FILLY, foaled in 1888	15	10	5
47	FILLY, foaled in 1889	15	10	5
48	FILLY, foaled in 1890	15	10	5

*Two Champion Prizes of £25 each, for
the best Clydesdale Stallion and Mare or
Filly, are offered by the Clydesdale Horse
Society.*

SUFFOLK.

49	STALLION, foaled in 1888	20	10	5
50	STALLION, foaled in 1889	20	10	5
51	MARE AND FOAL	20	10	5
52	FILLY, foaled in 1888	15	10	5
53	FILLY, foaled in 1889	15	10	5

AGRICULTURAL HORSES.

54	GELDING of any breed, foaled in 1887 or 1888 ¹	15	10	5
55	GELDING of any breed, foaled in 1889 ¹	15	10	5

Offered by the Doncaster Local Committee.

CATTLE (£1,500).

Class	SHORTHORN.	Prizes		
		1st £	2nd £	3rd £
56	BULL, calved in 1885, 1886, 1887, or 1888	20	10	5
57	BULL, calved in 1889	20	10	5
58	BULL, calved in 1890	20	10	5
59	Cow, in-milk or in-calf, calved previously to 1888	15	10	5
60	HEIFER, in-milk or in-calf, calved in 1888	15	10	5
61	HEIFER, calved in 1889	15	10	5
62	HEIFER, calved in 1890	15	10	5

Two Pieces of Plate of the value of 25l. each are offered by the Shorthorn Society of Great Britain and Ireland as Champion Prizes for the best Male and the best Female Shorthorn.

HEREFORD.

63	BULL, calved in 1885, 1886, 1887, or 1888	20	10	5
64	BULL, calved in 1889	20	10	5
65	BULL, calved in 1890	20	10	5
66	Cow or HEIFER, in-milk or in-calf, calved pre- viously to or in 1888	15	10	5
67	HEIFER, calved in 1889	15	10	5
68	HEIFER, calved in 1890	15	10	5

DEVON.

69	BULL, calved 1886, '7, or '8	15	10	5
70	BULL, calved 1889 or 1890	15	10	5
71	Cow or HEIFER, in-milk or in-calf, calved pre- viously to or in 1888	15	10	5
72	HEIFER, calved 1889 or '90	15	10	5

SUSSEX.

73	BULL, calved 1886, '7, or '8	15	10	5
74	BULL, calved 1889 or 1890	15	10	5
75	Cow or HEIFER, in-milk or in-calf, calved pre- viously to or in 1888	15	10	5
76	HEIFER, calved 1889 or '90	15	10	5

WELSH.

77	BULL, calved 1888, '9, or '90	10	5	-
78	Cow or HEIFER, of any age, in-milk or in-calf	10	5	-

RED-POLLED.

79	BULL, calved 1886, '7, or '8	15	10	5
80	BULL, calved 1889 or 1890	15	10	5
81	Cow or HEIFER, in-milk or in-calf, calved pre- viously to or in 1888	15	10	5
82	HEIFER, calved 1889 or '90	15	10	5

A Champion Prize of Ten Guineas is offered by the Red-Polled Society for the best Red-Polled exhibited.

Class	ABERDEEN-ANGUS.	Prizes		
		1st £	2nd £	3rd £
83	BULL, calved in 1886, '7, or '8	15	10	5
84	BULL, calved 1889 or 1890	15	10	5
85	Cow or HEIFER, in-milk or in-calf, calved pre- viously to or in 1888	15	10	5
86	HEIFER, calved 1889 or '90	15	10	5

GALLOWAY.

87	BULL, calved 1886, '7, or '8	15	10	5
88	BULL, calved 1889 or 1890	15	10	5
89	Cow or HEIFER, in-milk or in-calf, calved pre- viously to or in 1888	15	10	5
90	HEIFER, calved 1889 or '90	15	10	5

AYRSHIRE.

91	BULL, calved in 1888, 1889, or 1890	10	5	-
92	Cow or HEIFER, of any age, in-milk or in-calf	10	5	-

JERSEY.

93	BULL, calved in 1887, 1888, or 1889	15	10	5
94	BULL, calved in 1890	15	10	5
95	Cow, in-milk, calved pre- viously to or in 1887	15	10	5
96	Cow, in-milk, calved 1888	15	10	5
97	HEIFER, in-milk or in-calf, calved in 1889	15	10	5
98	HEIFER, calved in 1890	15	10	5

GUERNSEY.

99	BULL, calved in 1887, 1888, or 1889	15	10	5
100	BULL, calved in 1890	15	10	5
101	Cow or HEIFER, in-milk, calved previously to or in 1888	15	10	5
102	HEIFER, calved 1889 or '90	15	10	5

KERRY.

103	BULL, calved 1888, '9, or '90	10	5	-
104	Cow or HEIFER, of any age, in-milk or in-calf	10	5	-

DEXTER KERRY.

105	BULL, calved in 1888, 1889, or 1890	10	5	-
106	Cow or HEIFER, of any age, in-milk or in-calf	10	5	-

DAIRY CATTLE.

Cows, in-milk (of any breed or cross), giving the greatest quantity of milk containing not less than 12 per cent. solids and 8 per cent. butter-fat.

107	A. Cow, of 1,100 lbs. or over, live weight	15	10	5
107	B. Cow, under 1,100 lbs. live weight	15	10	5

SHEEP (£1,170).

Classes

108—111 Leicester	} For Prizes see below
112—115 Cotswold	
116—119 Lincoln	
120—123 Oxford Down	
124—127 Shropshire	
128—131 Southdown	
132—135 Hampshire Down	
136—139 Suffolk	}
140—143 Wensleydale	

In each of the above breeds the following prizes will be given :

	1st	2nd	3rd
	£	£	£
TWO-SHEAR RAM	15	10	5
SHEARLING RAM	15	10	5
PEN OF THREE RAM LAMBS, dropped in 1891	10	5	-
PEN OF THREE SHEARLING EWES, of the same flock	15	10	5

Classes

144—146 Border Leicester	} For Prizes see below
147—149 Cheviot	
150—152 Blackfaced Mountain	
153—155 Lonk	
156—158 Herdwick	

In each of the above breeds the following prizes will be given :

	1st	2nd	3rd
	£	£	£
RAM, Two-shear and upwards	10	5	-
SHEARLING RAM	10	5	-
PEN OF THREE SHEARLING EWES, of the same flock	10	5	-

PIGS (£432).

Classes

159—162 Large White	} For Prizes see below
163—166 Middle White	
167—170 Small White	
171—174 Berkshire	
175—178 Any Other Black Breed	
179—182 Tamworth	

In each of the above breeds the following prizes will be given :—

	1st	2nd	3rd
	£	£	£
BOAR, farrowed in 1890	10	5	3
PEN OF THREE BOAR PIGS, farrowed in 1891	10	5	3
BREEDING SOW, farrowed pre- viously, to or in 1890	10	5	3
PEN OF THREE SOW PIGS, far- rowed in 1891	10	5	3

POULTRY (£343).**FOWLS**

Prizes are offered for the best Cock, Hen, Cockerel, and Pullet respectively, of each of the following Breeds :—

Classes	£	£	£
183—186 Dorking, Coloured	2	1	10
187—190 Dorking, Silver Grey	2	1	10
191—194 Dorking, White or any other variety	2	1	10
195—198 Game, Old English	2	1	10
199—202 Game, Indian	2	1	10
203—206 Houdan	2	1	10
207—210 Other French	2	1	10
211—214 Brahma	2	1	10
215—218 Cochín	2	1	10
219—222 Langshan	2	1	10
223—226 Wyandotte	2	1	10
227—230 Plymouth Rock	2	1	10
231—234 Scotch Grey	2	1	10
235—238 Minorca	2	1	10
239—242 Andalusian	2	1	10
243—246 Leghorn	2	1	10
247—250 Hamburg	2	1	10
251—254 Any other variety (Bantams excepted)	2	1	10

Table Fowls.

255 Pair of Cockerels of 1891, of any pure breed	2	1	10
256 Pair of Pullets, ditto	2	1	10
257 Pair of Cockerels of 1891, first cross from any pure breeds	2	1	10
258 Pair of Pullets, ditto	2	1	10

DUCKS.

Prizes are offered for the best Drake, Duck, Young Drake, and Duckling respectively of each of the following Breeds :—

259—262 Aylesbury	2	1	10
263—266 Rouen	2	1	10
267—270 Pekin	2	1	10
271—274 Any other Useful Breed	2	1	10

Table Ducks.

275 Pair of Ducklings of 1891, of any pure breed	2	1	10
276 Pair of Ducklings of 1891, of a first cross from any pure breeds	2	1	10

GEESE.

277 Gander	2	1	10
278 Goose	2	1	10

TURKEYS.

279 Cock	2	1	10
280 Hen	2	1	10

PRODUCE (£276).

Class	CHEESE	Prizes			
		1st	2nd	3rd	4th
	(of 1891 make)	£	s	d	
281	THREE CHEDDAR	15	10	5	-
282	THREE CHESHIRE	15	10	5	-
283	SIX STILTON	15	10	5	-
284	THREE COTHERSTONE	10	5	3	-
285	THREE WENSLEYDALE	10	5	3	-
286	THREE of any other				
	British make	15	10	5	3
287	THREE CREAM	8	2	1	-
288	THREE SOFT	8	2	1	-

BUTTER.

289	THREE lbs. FRESH BUTTER	Five of 5 $\frac{1}{2}$ each
		Five of 3 $\frac{1}{2}$ each
290	3 lbs. FRESH BUTTER, slightly salted	Five of 5 $\frac{1}{2}$ each
		Five of 3 $\frac{1}{2}$ each
291	KEG OR OTHER PACKAGE OF SALT BUTTER, 1st 5 $\frac{1}{2}$, 2nd 3 $\frac{1}{2}$, 3rd 2 $\frac{1}{2}$, 4th 1 $\frac{1}{2}$.	

CIDER AND PERRY.

Class		Prizes		
		1st	2nd	3rd
		£	s	d
292	Oak of CIDER, made 1890	5	3	2
293	One Doz. CIDER, made 1890	5	3	2
294	One Doz. CIDER, made before 1890	5	3	2
295	One Doz. PERRY	5	3	2

JAMS AND PRESERVED FRUITS.

296	WHOLE FRUIT JAMS	5	3	2
297	BOTTLED FRUITS	5	3	2
298	PRESERVED FRUITS for Dessert	5	3	2
299	DRIED OR EVAPORATED FRUITS for Cooking	5	3	2

HIVES, HONEY, &c.

Offered by British Bee-keepers' Assocn.

Class		Prizes			
		1st	2nd	3rd	4th
		£	s	d	
300	Collection of Hives &c.	100	50	-	-
301	OBSERVATORY HIVE	20	15	10	-
302	FRAME HIVE	20	15	10	-
303	FRAME HIVE for Cottager's use	20	15	10	-
304	HONEY EXTRACTOR	15	10	-	-
305	SECTION RACKS	15	10	5	-
306	RAPID FEEDER	10	5	-	-
307	12 Sections of COMB HONEY, about 12 lb.	20	10	5	-
308	6 Sections of COMB HONEY, about 6 lb.	20	10	5	-
309	RUN OR EXTRACTED HONEY, about 24 lb.	30	20	10	5
310	GRANULATED HONEY, weight about 12 lb.	20	10	5	-
311	Display of HONEY	50	30	10	-
312	USEFUL INVENTIONS	Special Prizes according to merit of each.			
313	MODEL OF A HIVE for Lectures	30	-	-	-
314	EXHIBIT of any other kind connected with Bee-Culture	20	10	5	-

IMPLEMENTS (£285).

Class		Prizes		
		£	s	d
1	THRESHING and FINISHING MACHINE	100	50	25
2	CREAM SEPARATOR (Power Machine)	30	20	-
3	CREAM SEPARATOR (Hand Machine)	20	10	-
4	MILKING MACHINE	20	10	-

FARMS (£300).

1	ARABLE and GRASS FARM of 200 acres and over	50	30	20
2	ARABLE and GRASS FARM, above 100 and not exceeding 200 acres	50	30	20
3	ARABLE and GRASS FARM, above 40 and not exceeding 100 acres	50	30	20

BUTTER-MAKING COMPETITIONS (£64).

CLASS 1. Open to United Kingdom.
 CLASS 2. Female Members of a Farmer's family not in service or working for wages.
 CLASS 3. Dairymaids in service who have never won a prize exceeding 1 $\frac{1}{2}$ l.
 CLASS 4. Dairymaids residing in Yorkshire.

Prizes: 1st 3 $\frac{1}{2}$ l., 2nd 2 $\frac{1}{2}$ l., 3rd 1 $\frac{1}{2}$ l., 4th 1 $\frac{1}{2}$ l., in each class.

HORSE-SHOEING COMPETITIONS (£32).

(Limited to shoeing-smiths in the county of York.)

CLASS 1. HUNTERS.
 CLASS 2. AGRICULTURAL HORSES.
 Prizes: 1st 6 $\frac{1}{2}$ l., 2nd 4 $\frac{1}{2}$ l., 3rd 3 $\frac{1}{2}$ l., 4th 2 $\frac{1}{2}$ l., 5th 1 $\frac{1}{2}$ l., in each class.

Last Day of Entry for Stock and Farm Produce, FRIDAY, MAY 1, 1891.
 (Post Entries at Double Fees up to TUESDAY, MAY 12.)

Copies of the detailed Regulations and Conditions under which these Prizes (which are open for General Competition) can be competed for, and Forms of Certificates of Entry, can be obtained on Application to the Secretary of the Society, at 12 Hanover Square, London, W.

I. A. E. I. 75.

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